Code No: P0104/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
WATER RESOURCES ENGINEERING-II
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the functions of various components of a dviversion work.
   (b) Discuss Khosla's theory for design of weirs on permeable foundations, Enumerate the various corrections that are needed in its application. [8+8]
2. Design 1 m Sarda type fall on a channel carrying 20 cumecs discharge whose bed width and water depth are 14 m and 1.5 m respectively. [16]
3. (a) What are the different types of canal outlets. Give one example of each. What are the criteria for selection of the outlet capacity.
   (b) Define the flexibility and sensitivity of an outlet, and derive a relation between them. [8+8]
4. (a) Explain the necessity of a cross-drainage structure. How do you classify cross-drainage works.
   (b) State how will you determine
      i. Contraction of canal waterway
      ii. Waterway for the drain, and
      iii. Thickness of floor for the drain in the transition reach in case of a siphon aqueduct. [8+8]
5. (a) Discuss the physical factors governing the selection of a particular type of dam.
   (b) Describe the zoning of storages of a reservoir. [8+8]
6. (a) What is a gallery? Mention any five purposes of providing gallery in dams.
   (b) Mention the critera to find the base width of the elementary profile of the gravity dam. Also derive expressions for base width by considering these criteria. [6+10]
7. (a) Explain the hydraulic and seepage failures of earth dams and possible remedies.
   (b) State the criteria for safe design of earth dams. [10+6]
8. (a) Mention different types of spillways. Also mention different types of gates used on spillways.
   (b) Discuss the salient features that affect the hydraulic design of an Ogee spillway with the help of relevant sketches. [6+10]

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Code No: P0104/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
WATER RESOURCES ENGINEERING-II
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss briefly how the surface and sub-surface flow across a barrage may eventually lead to failure of the barrage, if not properly controlled. What precautionary measures will you recommend to safeguard such failures. Illustrate your answer with neat sketches, wherever necessary.
   (b) What are the main causes of failure of weir on permeable foundations and what remedies would you suggest to prevent them. [8+8]

2. (a) What are different types of cisterns used in falls. Discuss their salient features.
   (b) Describe the procedure for the design of an Inglis-type fall. What are the advantages of this type of fall. [8+8]

3. (a) With the help of a sketch, explain the working of the Kennedy gauge outlet. Why this type of outlet is not popular.
   (b) Explain the working of an adjustable orifice semi-module (AOSM). What are its advantages and disadvantages. [8+8]

4. Explain the procedure for the design of a canal syphon, through neat sketch. [16]

5. (a) Discuss the requisites of good sites for various types of dams.
   (b) Differentiate clearly between the following:
      i. Flood control reservoir and a multipurpose reservoir
      ii. Retarding basin and a storage reservoir
      iii. Firm yield, design yield and secondary yield of a reservoir
      iv. Spillway, Dam, Barrage. [6+10]

6. A masonry dam 15 m high is trapezoidal in section with a top width of 1.5 m and bottom width of 8.5 m. The upstream face has a uniform batter of 1:10. Test the stability of the dam by considering weight of the dam, water pressure and uplift pressure only. Find out the principal stresses at the toe and heel of the dam. Assume unit weight of masonry as 22.4 KN/m^3. w for water = 9.8 KN/m^3; permissible shear stress of joint = 1370 KN/m^2. Consider full reservoir condition with no tail water. Free board is zero. [16]

7. (a) Discuss in detail the salient features of any two types of earthen dams with the help of neat sketches.
   (b) Mention the circumstances under which the earthen dams are preferred. [10+6]

8. Describe the functioning of chute spillway and shaft spillway with the help of neat sketches. [16]

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Code No: P0104/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
WATER RESOURCES ENGINEERING-II
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Draw a neat sketch showing various components of a canal headwork. Briefly explain the functions of each component.
   (b) What is the difference between a weir and a barrage. Why is a barrage preferred to weir in modern times. [8+8]
2. (a) What is meant by canal falls. Why are falls constructed in modern canal systems.
   (b) What are roughening devices. Discuss their use in construction of falls. [8+8]
3. (a) State briefly how you will fix up the location and capacity of canal outlet.
   (b) State requirements for an ideal outlet.Distinguish between a modular, a non-modular and a semi-modular outlet. Give on example of each type. [8+8]
4. (a) What are different types of cross drainage works. Explain them in brief.
   (b) Suggest suitable cross-drainage works, under the following situation and draw neat sketch to illustrate the same. [8+8]

	Canal data	Drainage data
FSL/HFL	125.00 m	124.00 m
bed level	125.00 m	122.00 m
Discharge	100 cumeces	20 cumeces

5. (a) Explain the significance of mass curve in the estimation of storage capacity of a reservoir.
   (b) Write advantages of buttress dam and Arched Buttress dam. [8+8]
6. Write short notes on the following forces with reference to gravity dams:
   i)Wave pressure
   ii) Silt pressure
   iii) Uplift pressure
   iv)Ice pressure. [16]
7. (a) Discuss the reasons for structural failures of earthen dams with the help of neat sketches.
   (b) Explain the component parts and functions of a rockfill dam. [10+6]

8. Write short notes on the following:
   (a) Dropping shutters
   (b) Stop logs
   Also draw the relevant sketches [16]

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Code No: P0104/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
WATER RESOURCES ENGINEERING-II
(Civil Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is the purpose of providing a fish ladder. Discuss the general considerations for its design.
   (b) What do you understand by critical gradient. What will happen if the critical Gradient is exceeded. What is Khosla?s safe exit gradient. [8+8]

2. Design a cross-regulator and the head regulator for a distributory from the following data.
   Discharge of parent channel = 110 cumecs
   Discharge of distributory = 15 cumecs
   F.S.L. of parent channel U/S / D/S = 200.00/199.80
   Bed width of parent channel U/S / D/S = 45 m/40 m. [16]

3. (a) What are the different types of canal outlets. Give one example of each. What are the criteria for selection of the outlet capacity.
   (b) Define the flexibility and sensitivity of an outlet, and derive a relation between them. [8+8]

4. Explain the procedure for the design of a canal syphon, through neat sketch. [16]

5. (a) Discuss the physical factors governing the selection of a particular type of dam.
   (b) Describe the zoning of storages of a reservoir. [8+8]

6. The following figure 6 gives profile of a gravity dam with reservoir level as shown. If the co-efficient of friction is 0.8 and weight density of concrete is $2.4t/m^3$, Check the safety of the dam against sliding and overturning. Assume any other data not given. [16]

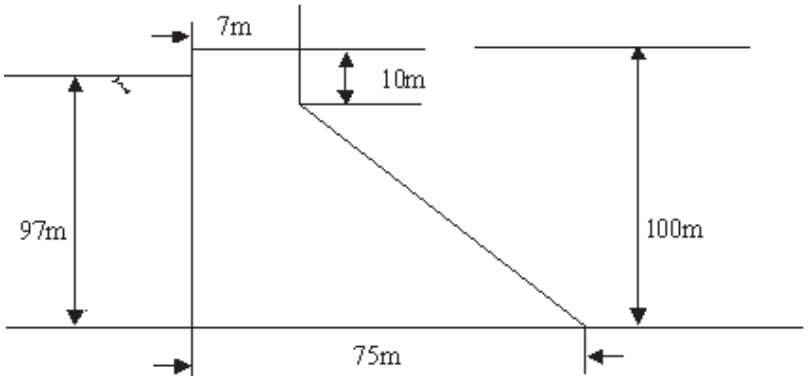

Figure 6

7. Sketch out sections of earth dam to suit various conditions of available material and existing foundation conditions. [16]

8. Write short notes on the following:

   (a) Dropping shutters

   (b) Stop logs
   Also draw the relevant sketches [16]

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Code No: P0202/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain in detail about Systematic and Random errors.
   (b) A voltmeter having a sensitivity of 1000 ohm/volt, reads 100v on its 150v scale when connected across an unknown resister in series with a millimeter. When the milliammeter reads 5 mA, calculate
   (i)apparent resistance of unknown,
   (ii) actual resistance of unknown resister,
   (iii) the error due to the loading effect of the voltmeter. [8+8]
2. (a) What are line spectra of a signal and how can they be represented?
   (b) Write a note on the representation of a periodic signal. What is its complex representation? [8+8]
3. How is vertical axis of an oscilloscope deflected? How does this differ from horizontal axis? Explain in detail. [16]
4. Give the basic principle of dual slope method and also state the advantages and disadvantages. [16]
5. (a) Explain the principle and working of peak reading voltmeter with a block diagram.
   (b) Explain the two modes of operation of a vector impedance meter. [8+8]
6. What is a resolver? Classify resolvers. Mention a few applications of resolvers. [16]
7. (a) Discuss in detail about strain gauge Rosettes.
   (b) The strain gauge having a gauge factor of 2 is connected in a bridge circuit having an excitation voltage 8V. The resistances are equal.It is subjected to a strain of 0.006. If this output is to represent $2/3^{rd}$ of full scale deflection of a recorder, **what should be the gain of the amplifier**. The full scale input voltage of the recorder is 1V. [10+6]
8. Write a short notes on the following:
   (a) Electromagnetic flow meter
   (b) Inductive method of liquid level measurement
   (c) thermocouples. [6+5+5]

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Code No: P0202/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the terms
   (a) Static error
   (b) Static Correction
   (c) Relative error and
   (d) Percentage Relative Error. [4+4+4+4]
2. Explain the classification of signals and also give their representation of signals. [16]
3. Define deflection sensitivity and deflection factor of a cathode ray tube. [16]
4. What is the digital frequency meter? Explain its principle of operation, construction and working. [16]
5. (a) Explain the working of a heterodyne wave analyzer with a neat block diagram.
   (b) Explain the principle and operation of basic spectrum analyzer with a neat block diagram. [6+10]
6. Discuss about the following strain gauges
   (a) unbonded metal strain gauges
   (b) bonded wire strain gauges. [6+10]
7. (a) Explain about the strain gauge torque meters.
   (b) A single electrical resistance strain gauge of resistance 120Ω and having a gauge factor of 2 is bonded to steel having elastic limit stress of 400MN/m^2. and modulus of elasticity 200GN/ m^2.Calculate the change in resistance due to
      i. change in stress equal to $1/10^{th}$ of the elastic range
      ii. change of temperature of 20 ^{0}C if the material is advanced alloy. The resistance temperature coefficient of alloy is $20 \times 10^{-6}/\ ^0$C.
      iii. Calculate the strain due to the differential expansion of the guage metal and steel, if coefficient of linear expansion of the steel is $12 \times 10^{-6}/\ ^0$C and that of the advanced alloy is $16 \times 10^{-6}/\ ^0$C. [8+8]
8. Write a short notes on the following:

(a) Inductive torque transducer

(b) Pirani gauge

(c) RTD. [16]

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Code No: P0202/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define a dynamic response of an instrument.
   (b) What are span accuracy and point accuracy. [8+8]
2. Define aperiodic signals. Write about the mathematical representation of aperiodic signals, with examples and necessary waveforms? [16]
3. (a) Write short notes on screen for CRTs.
   (b) Explain how phase can be measured using CRO. [8+8]
4. With a neat sketch explain the working of integrating type digital voltmeter. [16]
5. A circuit consisting of a coil ,a resistance and a variable capacitor connected in series and is tuned to resonate a Q meter if the frequency is 500 k Hz, resistance 0.5Ω and the variable capacitor set to 350 pF. Calculate the effective inductance and resistance of the coil if the Q meter indicates 90. [16]
6. (a) What are the advantages and disadvantages of Resistance potentiometers.
   (b) the output of a potentiometer is to be read by a recorder of 10kΩ input resistance. The non linearity must be held to 1%.a family of potentiometers having a thermal rating 5W and resistances ranging from 100Ω to 10 kΩ in-steps of 100 are available. Choose from a family of potentiometers that has greatest sensitivity which meets the non linearity requirement. Find the maximum permissible value with this potentiometer. What is the sensitivity if the potentiometer is of single turn? [6+10]
7. (a) What are the uses of strain gauges.
   (b) Explain various strain gauge circuits. [4+12]
8. (a) Explain the principles of temperature measurement with thermistors.
   (b) State the thermoelectric laws and explain them briefly.
   (c) Describe the construction of resistance wire thermometers. [6+5+5]

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Code No: P0202/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Define the following
   (a) Arithmetic mean
   (b) Median
   (c) Standard deviation
   (d) Variance. [4+4+4+4]
2. Describe 'sampling of data'. How is it different from pulse modulation? [16]
3. Draw the block diagram of a general purpose CRO and explain the functions of the following controls:
   (a) Intensity
   (b) Focus
   (c) Horizontal and Vertical positioning
   (d) Synchronization. [4+4+4+4]
4. (a) Mention in which ways the digital voltmeters differ.
   (b) Write any four advantages and disadvantages of Linear Ramp technique. [8+8]
5. (a) What is a wave analyzer? Mention its significance in measurement system
   (b) Explain the working of a Frequency selective wave analyzer with a neat block diagram.
   (c) Mention few applications of heterodyne wave analyzers. [4+8+4]
6. (a) What is the principle of operation of photoconductive cell? Explain any two applications of photoconductive cells.
   (b) A pressure measuring instrument uses a capacitive transducer of having a spacing of 4mm between its diaphragms. A pressure of 600kN/m2 produces an average deflection of 0.3mm of the diaphragm of the transducer. The transducer which has a capacitance of 300pF before the application of the pressure and is connected in oscillatory circuit having a frequency of 100kHz. Determine the change in the capacitance after the pressure is applied to the transducer. [8+8]
7. (a) Discuss in detail about strain gauge Rosettes.

(b) The strain gauge having a gauge factor of 2 is connected in a bridge circuit having an excitation voltage 8V. The resistances are equal.It is subjected to a strain of 0.006. If this output is to represent $2/3^{rd}$ of full scale deflection of a recorder, **what should be the gain of the amplifier**. The full scale input voltage of the recorder is 1V. [10+6]

8. (a) Describe the principle and operation of Knudsen gauge with a neat sketch.

(b) Describe the operation of Ionization gauges for pressure measurement. [8+8]

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Code No: Q0302/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
DYNAMICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics, Production Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. The wheels of a motor cycle have a moment of inertia of 2.5 kg m^2 and the engine parts has moment of inertia 0.15kg m^2.The axis of rotation of engine crank shaft is parallel to that of road wheels. If the gear ratio is 5 to 1, the dia of road wheels is 65cm, and the motor rounds a curve of 30m radius at 16m/s, Find the magnitude and direction of gyroscopic couple. [16]

2. (a) Derive the expression for the force required to move the body up through the inclined plane.
   (b) A 150 mm diameter valve, against which a steam pressure of 2 MN/m^2 is acting, is closed by means of a square threaded screw 50 mm in external diameter with 6 mm pitch. If the coefficient of friction is 0.12, find the torque required to turn the handle. [6+10]

3. (a) Describe with neat sketch the rope brake dynamometer.
   (b) A single block brake is shown in figure 3 the diameter of drum is 300mm and the angle of contact is 120 degrees. If the operating force of 600N is applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.5 determine the torque that may be transmitted by the block brake. [6+10]

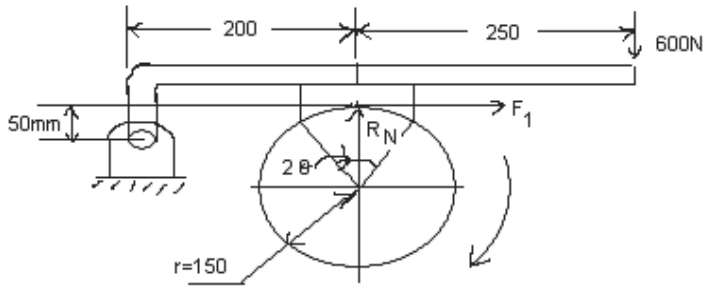

Figure 3

4. (a) Derive the expression for the angular velocity and angular acceleration of the connecting rod.
   (b) A machine shaft running at an average speed of 340 rpm requires a constant torque of 1400N-m during 2 revolutions and a constant torque of 400 N-m during the next three revolutions, this cycle is being repeated. It is to be driven directly by a constant torque motor.Find the Power of the motor required and

the moment of inertia of a fly wheel in order that the total fluctuation of speed shall not exceed 5% of mean speed which is 300 rpm. [6+10]

5. The upper arms of a Porter governor are pivoted at the axis of rotation and are 30 cm in length. The lower arms are 27.5 cms in length and are attached to the sleeve at a distance of 5 cm from the axis of rotation. The weight of each ball is 6 kgf and the central weight is 48 kgf. Calculate the equilibrium speed of the governor when the radius of rotation is 17.5 cm. Determine also the effort and power of governor for 1% variation of speed. [16]

6. A, B, C and D are four masses carried by a rotating shaft at radii of 10 cm, 12.5 cm, 20 cm and 15 cm respectively. The planes in which the masses revolve are 60 cm apart and the mass of B, C and D are 10 kg, 5 kg and 4 kg respectively. Find the required mass A and the relative angular setting of the four masses so that the shaft is in complete balance. (Assuming the plane of mass as the reference plane.) [16]

7. The following data relate to a single cylinder reciprocating engine.
   Mass of reciprocating parts = 40 kg
   Mass of revolving parts = 30 kg at 180mm radius.
   Speed = 150 rpm
   Stroke length = 350 mm
   If 60% of the reciprocating parts and all the revolving parts to be balanced, determine the
   (a) Balanced mass required at a radius of 320 mm.
   (b) The unbalanced force when the crank has turned 450 from the top dead center. [16]

8. (a) Determine natural frequency of the pendulum system.
   (b) Define:
      i. Free vibrations
      ii. Forced vibrations
      iii. Damping. [16]

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Code No: Q0302/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
DYNAMICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics, Production Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain what do you understand by gyroscopic stabilization? Explain with the help of a neat sketch. How this is carried out in ships and obtain a reaction between the gyroscopic torque and the couple applied by the waves for complete stabilization of the waves be sinusoidal.
   (b) The rotary engine and the propeller of an air craft weigh 3600N and have a radius of gyration of 35cms. When viewed from the front the engine rotates in the clockwise direction at 1500rpm. When propelling at 560m/sec the air craft takes a right hand turn on a circle of 20m radius. Determine the magnitude and direction of the gyroscopic torque acting on the air craft. [6+10]

2. (a) State the laws of dry friction.
   (b) A screw jack is used to raise a load of 50kN. The pitch of single start square threads used for the screw is 24mm. The mean diameter is 72mm. Determine the force to be applied at the end of 1.2m long handle when the load is lifted with constant velocity and rotate with the spindle. Take coefficient of friction =0.2. Also find the mechanical efficiency of the jack. [4+12]

3. (a) Describe with neat sketch the fottinger torsion dynamometer.
   (b) A simple band brake is operated by a lever of length 500mm. The brake drum has a diameter of 500mm and the brake band embraces 5/8th of the circumference. One end of the band is attached to the fulcrum of the lever while the other is attached to a pin on the lever 100mm from the fulcrum. If the effort applied to the end of the lever is 3kN and the coefficient of friction is 0.25, find the maximum braking torque on the drum. [6+10]

4. (a) State how the size of the flywheel calculated.
   (b) A single cylinder four stroke oil engine develops 15kW at a speed of 400 rpm and drives a machine at 750 rpm. the engine shaft carries a flywheel with a moment of inertia of 114 kg-m^2.The machine shaft also carries a flywheel with the moment of inertia of 8 kg-m^2. If the fluctuation of energy is 80If the coefficient of fluctuation of speed is required to be lowered to a total value of 1%, what is the moment of inertia of the additional rotating mass to be fitted to the machine shaft? [6+10]

5. All the four arms of a Porter governor are 30cm long and are hinged at a distance of 3 cm from the axis of rotation. Each ball weighs 80 N. The weight of the sleeve is 750 N. Find the equilibrium speed corresponding to the radius of rotation of 23

cm. Also determine the higher and lower speeds for this configuration, if a frictional force of 50 N acts against the moment of the sleeve. [16]

6. Two weights of 8 kg and 16 kg rotate in the same plane at radii of 1.5 and 2.25 m respectively. The radii of these weights are 60^0 apart. Find the position of the third weight of the magnitude of 12 kg in the same plane which can produce static balance of the system. [16]

7. A four coupled-wheel locomotive with two inside cylinders has reciprocating and revolving parts per cylinder as 300 kgf and 250 kgf respectively. The distance between planes of driving wheels is 150 cms. The pitch of cylinders is 60 cms. The diameter of tread and driving wheels is 190 cms and the distance between planes of coupling rod cranks in 190 cms. The revolving parts for each coupling rod crank are 125 kgf. The angle between engine cranks is 90^0 and the length of coupling rod crank 22 cms. The angle made by coupling rod crank with adjustment crank is 18^0. The distance of center of gravity of balance weights in planes of driving wheels from a scale center is 75 cms. Crank radius is 32 cms. Determine:

   (a) The magnitude and position of balance weights required in leading and trailing wheels to balance2/3 of reciprocating and whole of revolving parts if half of the required reciprocating parts are to be balanced in each pair of coupled wheels.

   (b) The maximum variation of tractive force and hammer blow when locomotive speed is 100kmph. [16]

8. A vibrating system consists of a mass 50 kg, a spring of stiffness 30 KN/m and a damper. The damping provided is only 20% of the critical value. Determine:

   (a) The damping factor.

   (b) The critical damping coefficient.

   (c) The logarithmic decrement.

   (d) The natural frequency of damped vibrations.

   (e) The ratio of two consecutive amplitudes. [16]

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Code No: Q0302/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
DYNAMICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics, Production Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Differentiate between natural precision and forced precision.
   (b) Locomotive moving at a speed of 100 km/hr turns round a curve of 500m radius to the right. The pair of driving wheels is 2m in diameter and along with the axle weigh 20KN. The radius of gyration of wheels together with the axle may be taken as 0.6m. Find the gyro effect on the pair of driving wheels. [6+10]

2. (a) Discuss about the friction between lubricated surfaces.
   (b) A vertical shaft supports a load of 20kN in a conical pivot bearing.The external radius of the cone is three times the radius and the cone angle is 120 degrees. Assuming uniform intensity of pressure as 0.35 MN/mm^2, determine the dimensions of the bearing. [4+12]

3. (a) Describe with neat sketch the belt transmission dynamometer.
   (b) A single block brake is shown in figure 3 the diameter of drum is 250mm and the angle of contact is 120 degrees. If the operating force of 600N is applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.5 determine the torque that may be transmitted by the block brake. [6+10]

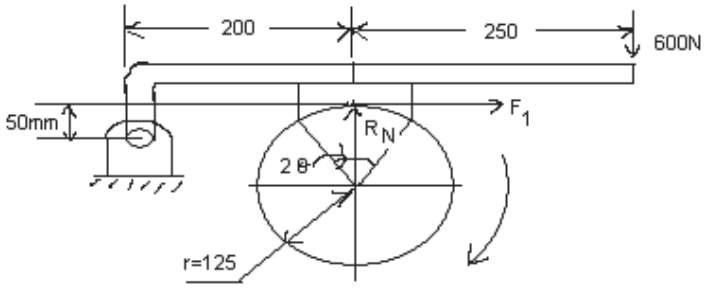

Figure 3

4. (a) Explain the uses of crank effort diagrams.
   (b) The areas above and below the line of mean resistance taken in an order in the turning moment diagram for a steam engine are +3.1, -2.05,+2.2,-2.95,+1.22,-2.44,+2.25 and -1.33 sq cm.
   The scales of the diagram are,
   Turning moment, 1sqcm= 10kN-m

Crank angle, 1 cm = 24 degrees
The mean revolutions per minute are 180 and the total fluctuation of speed is not to exceed 2.5% of the mean. Determine suitable cross section for the rim of the flywheel assuming that the rim stores 9.5% of the energy. Mean peripheral velocity of the rim is 20 m/s and the density of the rim material is 0.0072 kg/cm^3. [4+12]

5. A Porter governor carries a central load of 30 kgf and each ball weighs 4.5 kgf. The upper links are 20cm long and the lower links are 30 cms long. The points of suspension of upper and lower links are 5cms from axis of spindle. Calculate:
   (a) The speed of the governor in rpm if the radius of revolution of the governor ball is 12.5 cm and
   (b) The effort of the governor for increase of speed of 1%. [16]

6. Two weights of 8 kg and 16 kg rotate in the same plane at radii of 1.5 and 2.25 m respectively. The radii of these weights are 60^0 apart. Find the position of the third weight of the magnitude of 12 kg in the same plane which can produce static balance of the system. [16]

7. A four coupled-wheel locomotive with two inside cylinders has reciprocating and revolving parts per cylinder as 300 kgf and 250 kgf respectively. The distance between planes of driving wheels is 150 cms. The pitch of cylinders is 60 cms. The diameter of tread and driving wheels is 190 cms and the distance between planes of coupling rod cranks in 190 cms. The revolving parts for each coupling rod crank are 125 kgf. The angle between engine cranks is 90^0 and the length of coupling rod crank 22 cms. The angle made by coupling rod crank with adjustment crank is 18^0. The distance of center of gravity of balance weights in planes of driving wheels from a scale center is 75 cms. Crank radius is 32 cms. Determine:
   (a) The magnitude and position of balance weights required in leading and trailing wheels to balance2/3 of reciprocating and whole of revolving parts if half of the required reciprocating parts are to be balanced in each pair of coupled wheels.
   (b) The maximum variation of tractive force and hammer blow when locomotive speed is 100kmph. [16]

8. A machine mounted on springs and fitted with a dashpot has a mass of 60 kg. There are three springs, each of stiffness 12 N/mm. The amplitude of vibrations reduces from 45 to 8 mm in two complete oscillations. Assuming that the damping force varies as the velocity. Determine:
   (a) The damping coefficient.
   (b) The ratio of frequencies of damping and undamped vibrations and
   (c) The periodic time of damped vibrations. [16]

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Code No: Q0302/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
DYNAMICS OF MACHINERY
(Common to Mechanical Engineering, Mechatronics, Production Engineering and Automobile Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What is stabilization of a ship? Why is it necessary? How is it carried out?
   (b) A uniform disc of radius of gyration 15cms on weighing 50N is mounted on one end of an arm of length 60cms the other end of the arm is free to rotate in a universal bearing. If the disc rotates about the arm with a speed of 300 rpm clockwise looking from the front, with what speed will it precess about the vertical axis. [8+8]

2. (a) What is meant by the following? Friction, friction force, coefficient of friction, limiting friction, angle of friction and angle of repose.
   (b) The thrust on the propeller shaft of a marine engine is taken up by 8 collars whose external and internal diameters are 660 mm and 420 mm respectively. The thrust pressure is 0.4 MN/mm^2 and may be assumed uniform. The coefficient of friction between the shaft and collars is 0.04. If the shaft rotates at 90 r.p.m.: find
      i. total thrust on the collars: and
      ii. power absorbed by friction on the bearing. [6+10]

3. (a) Describe with neat sketch the rope brake dynamometer.
   (b) A single block brake is shown in figure 3 the diameter of drum is 300mm and the angle of contact is 120 degrees. If the operating force of 600N is applied at the end of a lever and the coefficient of friction between the drum and the lining is 0.5 determine the torque that may be transmitted by the block brake. [6+10]

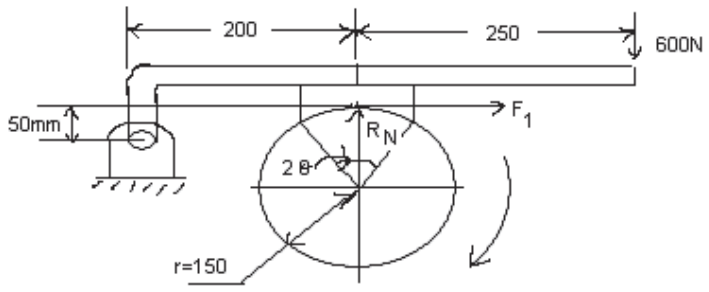

Figure 3

4. (a) Distinguish clearly between the terms “crank-pin Effort” and “crank effort” and derive the expressions for these.

(b) A single acting Otto cycle engine develops 38 kW at 150 rpm with 75 explosions /min.The change of speed from the commencement to the end of power stroke must not exceed 0.5% of the mean speed on either side .design a suitable rim section having width four times the depth, so that hoop stress does not exceed 40 kg/sq cm. Assume that the flywheel stores 16/15 times the energy stored by the rim and that the work done during power stroke is 1.35 times the work done during the cycle .Density of rim material is 0.0072 kg/cm^3.

5. In a Porter governor, the links and arms are each 30 cms long. Each ball weighs 2.5 kg and the central load is 25 kg. For the lowest and highest of the sleeve the arms are inclined 30^0 and 40^0 respectively to the vertical. The friction at the governor and the mechanism connecting it to the valve is equivalent to a force of 2.5 kg at the sleeve. Assuming the links and arms intersect on the axis, find:

   (a) The travel of the sleeve

   (b) The minimum ascending speed

   (c) The maximum descending speed

   (d) Range of speed of the governor. [16]

6. A shaft 3 m span between the bearings carries two masses of 5 kg and 10 kg acting at the extremities of the arms 0.45 m and 0.6 m long respectively. The planes in which the masses rotate are 1.2 m and 2.4 m respectively from the left hand bearing and the angle between the arms is 60^0. If the speed of rotation is 100 rpm. Find the displacing force on the two bearings of the machine. If the masses are balanced by two additional rotating masses acting at a radius 0.3 and placed 0.3 m from each bearing, Estimate the magnitude of the two balanced masses and the angles at which they may be set with respect to the two arms. [16]

7. A 2-Cylinder uncoupled locomotive with cranks at 90^0 has a crank radius of 32.5 cms. The distance between centers of driving wheel is 150 cms. The pitch of cylinders is 60 cms. The diameter of treads of driving wheels is 180 cms. The radius of center of gravity of balance weights is 65 cms. The pressure due to dead load on each wheel is 4 tonnes. The weight of reciprocating and rotating parts per cylinder are 330 kg and 400 kg respectively. The speed of locomotive is 60 kmph. Find:

   (a) The balancing weights both in magnitude and position required to be placed in the planes of driving wheels to balance whole of the revolving and 2/3 of reciprocating masses.

   (b) Swaying couple.

   (c) The variation of tractive force. [16]

8. (a) Determine natural frequency of the pendulum system.

   (b) Define:

      i. Free vibrations

      ii. Forced vibrations

iii. Damping. [16]

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Code No: Q0402/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
VLSI DESIGN
(Common to Electronics & Communication Engineering, Bio-Medical Engineering and Electronics & Telematics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain the structure of MOS enhancement mode, Depletion mode and PMOS enhancement mode transistors.
   (b) Explain the working of an enhancement mode transistor with suitable diagrams. [12+4]
2. (a) What is body affect? Discuss different parameters on which threshold voltage depends?
   (b) Determine Z_{pu} to Z_{pd} ratio for nMOS inverter driven through one or more pass transistor? [8+8]
3. Design a stick diagram and layout diagram for the CMOS logic shown below $Y = \overline{(A+B)(C+D)}$. [16]
4. (a) Explain clocked CMOS logic, domino logic and n-p CMOS logic.
   (b) In gate logic, compare the geometry aspects between two -input NMOS NAND and CMOS NAND gates. [8+8]
5. (a) Explain the CMOS system design based on the I/O cells with suitable example.
   (b) Design a four bit parity generator using only XOR gates and draw the Schematic of it. [8+8]
6. (a) What are the differences between a gate array chip and standard-cell chip? What benefits does each implementation style have?
   (b) Write the equations for a full adder in SOP form. Sketch a 3-input, 2- output PLA implementing this logic. [8+8]
7. (a) Write a VHDL program in behavioral modeling with concurrent signal assignment.
   (b) Explain the method of switch-level simulation for CMOS circuits and name such a simulators. [8+8]
8. (a) What type of defects are tested in manufacturing testing methods?
   (b) What is the Design for Autonomous Test and what is the basic device used in this?
   (c) What type of tests are used to check the noise margin for CMOS gates?[4+6+6]

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Code No: Q0402/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
VLSI DESIGN
(Common to Electronics & Communication Engineering, Bio-Medical Engineering and Electronics & Telematics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Distinguish between thin film resistors and thin film capacitors in all aspects. [16]
2. (a) Discuss about the properties of pass transistors.
   (b) Consider a pFET that has a gate oxide thickness of t_{ox}=60A^0.The hole mobility is measured to be 220cm^2/V-Sec, and the aspect ratio is (W/L) =(12/1). Assume that V_{DD}=3.3V and $|V_{tp}|$ =0.7V.
      i. Calculate the process transconductanceK'_p in units of mA/V^2.
      ii. Find the device transconductance β_p. [8+8]
3. Draw the stick diagram and a translated mask layout for nMOS inverter circuit. [16]
4. (a) Explain the concept of sheet resistance and apply it to compute the ON resistance (V_{DD} to GND) of an NMOS inverter having pull up to pull down ratio of 4:1, If n channel resistance is $R_{sn} = 10^4$ Ω per square.
   (b) Calculate the gate capacitance value of 5μm technology minimum size transistor with gate to channel capacitance value is $4 \times 10^{-4} pF/\mu m^2$. [10+6]
5. (a) How can the components of CMOS system design be categorized into the groups.
   (b) Why is the static 6 transistor cell used for average CMOS system design?
   (c) Compare the performance of CMOS Off chip and On chip memory designs. [4+6+6]
6. (a) What are the differences between a gate array chip and standard-cell chip? What benefits does each implementation style have?
   (b) Write the equations for a full adder in SOP form. Sketch a 3-input, 2- output PLA implementing this logic. [8+8]
7. (a) What is Conditional Signal Assignment Statement? Write its syntax with example.
   (b) Explain the method of logic-level simulation for CMOS circuits and name such simulators. [8+8]
8. (a) Explain the manufacturing test of a chip with suitable examples.
   (b) Explain how an Ad-hoc test technique used to test long counters. [8+8]

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Code No: Q0402/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
VLSI DESIGN
(Common to Electronics & Communication Engineering, Bio-Medical Engineering and Electronics & Telematics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the recent trends in IC Technology.
   (b) What are the advantages of ICs over discrete components?
   (c) List the limitations of IC's. [8+4+4]
2. (a) Find g_m for an n-channel transistor with V_{gs}=1.2V: V_{tn} =0.8V; (W/L) = 10; $\mu_n C_{ox} = 92\mu A/V^2$.
   (b) Define the term threshold voltage of MOSFET and explain its significance. [8+8]
3. Explain various steps of high level design flow used in ASIC devices. [16]
4. (a) Explain clocked CMOS logic, domino logic and n-p CMOS logic.
   (b) In gate logic, compare the geometry aspects between two -input NMOS NAND and CMOS NAND gates. [8+8]
5. (a) How can the components of CMOS system design be categorized into the groups.
   (b) Why is the static 6 transistor cell used for average CMOS system design?
   (c) Compare the performance of CMOS Off chip and On chip memory designs. [4+6+6]
6. (a) What are different classes of Programmable CMOS devices? Explain them briefly.
   (b) What is the basis for standard-cell? What are basic classes of circuits for Library cells? [8+8]
7. (a) Write a VHDL program in behavioral modeling with concurrent signal assignment.
   (b) Explain the method of switch-level simulation for CMOS circuits and name such a simulators. [8+8]
8. (a) Explain the functionality test of a chip with suitable examples.
   (b) What are the categories of Design for testability? Explain them briefly. [8+8]

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Code No: Q0402/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
VLSI DESIGN
(Common to Electronics & Communication Engineering, Bio-Medical Engineering and Electronics & Telematics)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Clearly explain the diffusion process in IC fabrication.
   (b) Clearly explain various diffusion effects in silicon with emphasis on VLSI application. [8+8]
2. (a) Explain various regions of CMOS inverter transfer characteristics.
   (b) For a CMOS inverter, calculate the shift in the transfer characteristic curve when β_n/β_p ratio is varied from 1/1 to 10/1. [8+8]
3. (a) Discuss design rule for wires (orbit 2μm CMOS).
   (b) Discuss the transistor related design rule (orbit 2μm CMOS). [8+8]
4. Calculate ON resistance of the circuit shown in figure 4. From V_{DD} to ground. If n channel resistance is $R_{sn} = 10^4\ \Omega$ per square. [16]

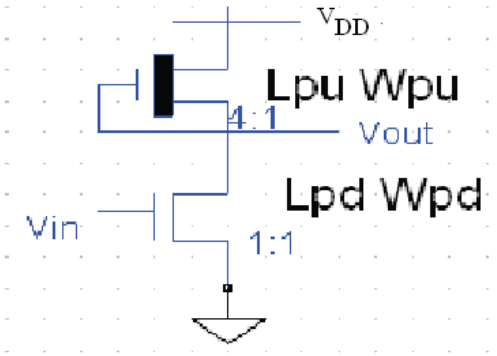

Figure 4

5. (a) Compare the different types of CMOS subsystem Multipliers.
   (b) Design a schematic for an 8-word × 2-bit NAND ROM that serves a lookup table to implement a full adder. [8+8]
6. (a) Draw the typical architecture of PAL and explain the operation of it.
   (b) What is CPLD? Draw its basic structure and give its applications. [8+8]
7. (a) What are the advantages of Hardware Description Languages and Software Languages?
   (b) What are different design verification tools and explain them in brief? [8+8]

8. (a) Explain how controllability and observability are used to test the CMOS circuits.
   (b) What are the different fault models? Compare them. [8+8]

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Code No: P0503/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
INFORMATION SECURITY
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Suggest a Network security model with neat illustration and explain the components of the model.
   (b) Explain about the Internet standards and RFCs. [8+8]
2. (a) Differentiate between the symmetric block ciphers and symmetric stream ciphers.
   (b) Write about Key distribution. [8+8]
3. (a) Explain the relationship between Digital signature and Certification authority.
   (b) Clearly explain the following corresponding to X.509 authentication service:
      i. One-way authentication
      ii. Two-way authentication
      iii. Three-way authentication. [8+8]
4. (a) What is Radix-64 format? Explain how both PGP and S/MIME perform the Radix-64 conversion is performed.
   (b) Describe the five principal services that Pretty Good Privacy (PGP) provides. [8+8]
5. (a) Discuss how sequence number field of Authentication header is used to thwart replay attacks?
   (b) What is a cookie? ISAKMP mandates that the cookie generation satisfy three basic requirements. What are they? Explain? [8+8]
6. (a) Describe the various SET participants?
   (b) How SSL sessions and connections are related to each other? Discuss about connection state parameters in detail? [8+8]
7. (a) Discuss in detail about network management architecture?
   (b) What are the deficiencies of SNMPV1?
   (c) Give a brief note of distributed network management. [8+4+4]
8. (a) What is a bastion host? List the common characteristics of a bastion host?
   (b) Explain the concept of reference monitor in detail with a neat sketch? [8+8]

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Code No: P0503/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
INFORMATION SECURITY
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain about how the Internet standards and RFCs.
   (b) Explain how Address Resolution Protocol table becomes a victim for attacks. [8+8]

2. (a) Explain why AES algorithm is an example of symmetric block cipher algorithm.
   (b) Write about Simple Hash functions. [8+8]

3. (a) Explain the procedure involved in RSA public-key encryption algorithm.
   (b) Explain what Kerberos is and give its requirements. [8+8]

4. (a) Explain the importance and usage of the following in relation to PGP:
      i. Session key
      ii. Signature
      iii. Public / Private keys.
   (b) Describe how S/MIME works towards emerging as an industry standard for e-mail security at commercial and organizational use levels. [8+8]

5. (a) Explain tunnel mode and transport mode functionality?
   (b) Discuss about Oakley key determination protocol? [8+8]

6. (a) What is WWW? What are the challenges web presents? Discuss?
   (b) Explain how SSL makes use of TCP to provide a reliable end-to-end secure service. [6+10]

7. (a) With a neat diagram explain SNMPV3 message format with USM?
   (b) Discuss about the four generations of the anti virus software? [10+6]

8. (a) List the design goals for a firewall?
   (b) What are false Positives and false Negatives?
   (c) What are the Properties that a Multilevel Secure System must enforce? [6+4+6]

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Code No: P0503/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
INFORMATION SECURITY
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Suggest a Network security model with neat illustration and explain the components of the model.
   (b) Explain about the Internet standards and RFCs. [8+8]
2. (a) Explain the use of S-Boxes in AES algorithm.
   (b) Differentiate between DES and AES algorithms.
   (c) Enumerate the various cipher block modes of operation. [5+5+6]
3. (a) Explain the procedure involved in RSA public-key encryption algorithm.
   (b) Explain what Kerberos is and give its requirements. [8+8]
4. (a) What is Radix-64 format? Explain how both PGP and S/MIME perform the Radix-64 conversion is performed.
   (b) Describe the five principal services that Pretty Good Privacy (PGP) provides. [8+8]
5. (a) Discuss the two ways in which the IPSec authentication service can be used?
   (b) List any eight ISAKMP payload types and describe them? [8+8]
6. (a) Draw the diagrams showing the relative location of security facilities in TCP/IP protocol stack? Discuss the advantages of each?
   (b) What is SSL session? Can a session be shared among multiple connections? What are the parameters that define a session state? [8+8]
7. (a) Discuss in detail about network management architecture?
   (b) What are the deficiencies of SNMPV1?
   (c) Give a brief note of distributed network management. [8+4+4]
8. Discuss firewall design principles in detail? [16]

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Code No: P0503/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
INFORMATION SECURITY
(Computer Science & Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss and explain the components of a model for Internetwork security.
   (b) What are the major four Network Security Services? Explain them in detail. [8+8]
2. (a) Differentiate between the symmetric block ciphers and symmetric stream ciphers.
   (b) Write about Key distribution. [8+8]
3. (a) Explain the procedure involved in RSA public-key encryption algorithm.
   (b) Explain what Kerberos is and give its requirements. [8+8]
4. (a) Show clearly how Confidentiality is ensured among users of PGP.
   (b) Give an overview of MIME and its functionality. [8+8]
5. (a) Explain how IP traffic is related to specific security associations?
   (b) What do you mean by replay attack? Explain how inbound processing proceeds in anti - reply mechanism when a packet is received? [8+8]
6. (a) Draw the diagrams showing the relative location of security facilities in TCP/IP protocol stack? Discuss the advantages of each?
   (b) What is SSL session? Can a session be shared among multiple connections? What are the parameters that define a session state? [8+8]
7. (a) Discuss in detail firewall characteristics?
   (b) Explain the techniques that detect intrusion by observing events in the system and applying a set of rules? [6+10]
8. Discuss in detail different types of firewall? [16]

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Code No: P0803/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
PROCESS DYNAMICS AND CONTROL
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Invert the transform $x(s) = \frac{1}{s(s^2-2s+5)}$
   (b) Solve $\frac{d^3x}{dt^3} + \frac{3d^2x}{dt^2} + \frac{3dx}{dt} + x = 1 \qquad x(0) = x'(0) = x''(0) = 0.$ [8+8]

2. Define and discuss the following terms with the help of a neat diagram:
   (a) Overshoot
   (b) Decay ratio
   (c) Rise time
   (d) Response time. [4×4]

3. Give short notes on any FOUR of the following:
   (a) Block diagram
   (b) Control system
   (c) Load
   (d) Set point
   (e) Error
   (f) Measuring element. [16]

4. Determine the transfer function Y(s)/X(s) for the block diagram shown in figure 4. [16]

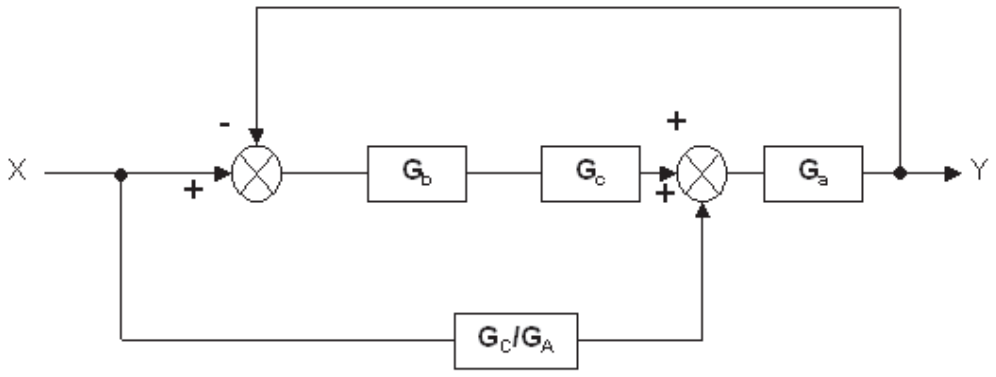

Figure 4

5. (a) Discuss the special cases of Routh test.
   (b) Determine the stability of control system whose characteristic equation is $s^5 + s^4 + 3s^3 + 5s^2 + 4s + 2 = 0$. [8+8]

6. (a)) Explain the substitution rule. Using the substitution rule, find the amplitude ratio and phase angle for general first and second order systems.
   (b) A control system which is stable for servo operation will be stable for regulator operation also. State true or false and justify the answer. [8+8]

7. Write short notes on
   (a) feedforward control
   (b) ratio control. [16]

8. Explain the Cohen and Coon method of tuning the controllers. [16]

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Code No: P0803/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
PROCESS DYNAMICS AND CONTROL
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Solve the following equation for $y(t)$ [16]

   $\int_0^t y(\tau)d\tau = \frac{dy(t)}{dt}$ $y(0) = 1$

2. A step change of magnitude 3 is introduces into the transfer function

   $\frac{Y(s)}{X(s)} = \frac{10}{(2s^2+0.3s+0.5)}$

   Determine the overshoot and frequency of oscillation. [16]

3. (a) Describe the terms Proportional band and Proportional Gain.
   (b) A pneumatic proportional controller is used to control the temperature with in the range of 100 to 250 ^{0}C. The controller is so adjusted that the output pressure goes from 5 psi (valve fully open) to 25 psi (valve fully closed) as the measured temperature goes from 150 to 175 ^{0}C with set point held constant. Find the Gain and proportional band. [6+10]

4. Derive the transfer function Y/X for the control system shown in figure 4. [16]

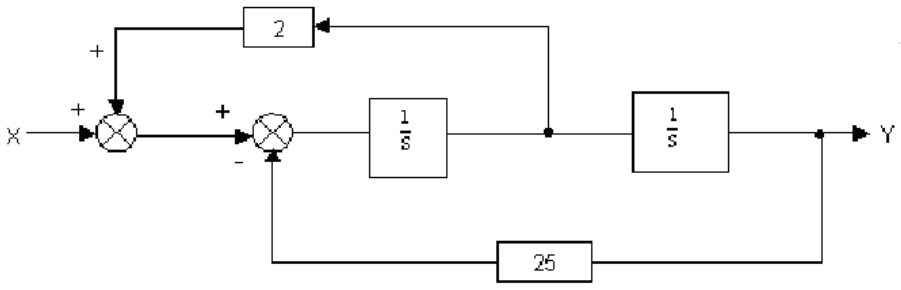

Figure 4

5. (a) Test the stability of the system whose characteristic equation is given by $s^5 + 2s^4 + 5s^3 + 10s^2 + 4s + 8 = 0$.
   (b) Determine the range of K such that feedback system having characteristic equation s $(s^2 + s + 1)$ $(s + 4)$ + K = 0, will be stable. [8+8]

6. Draw the root locus diagram for the system shown 6, where $G_c = K_c(1+0.5s +1/s)$. [16]

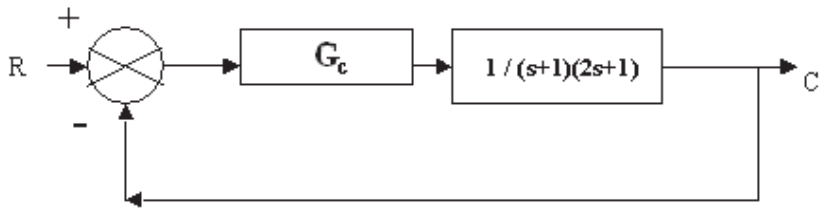

Figure 6

7. Discuss the rationale of a cascade control system and demonstrate why it provides better response than simple feedback. [16]

8. (a) A valve with a C_V rating of 4.0 is used to throttle the flow of glycerine for which G is 1.26. Determine the maximum flow through the valve for a pressure drop of 100 psi.

   (b) What are the reasons to use a valve positioner. [8+8]

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Code No: P0803/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
PROCESS DYNAMICS AND CONTROL
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Invert $x(s) = \frac{2}{s(s^2+2s+2)}$
   (b) Solve $\frac{d^2x}{dt^2} + 4x = 2e^{-t}$ $x(0) = x'(0) = 0.$ [8+8]

2. (a) Define step, impulse and sinusoidal input functions. Write their mathematical equations with graphical representation.
   (b) A thermometer has a time constant of 15 sec and an initial temperature of 20 ^{0}C is suddenly expanded to a temperature of 100 ^{0}C and held there. Determine the rise time and the temperature at the rise time. [6+10]

3. (a) What do you understand by the terms air-to-close, air-to-open actions involved in control valves?
   (b) What is linear valve? [8+8]

4. The location of the load change in a control loop may affect the system response. In the block diagram shown in figure 4, a unit step change in load enters at either location1 or location 2.
   (a) What is the offset when the load enters at location 1 and when it enters at location 2.
   (b) Sketch the transient response to a step change U_1 and to a step change in U_2. [16]

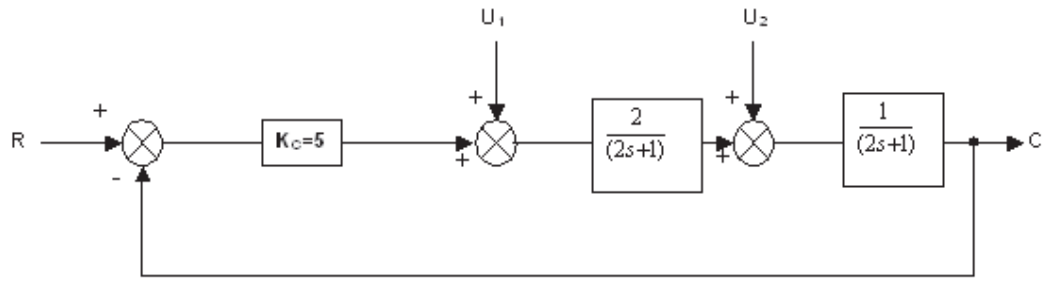

Figure 4

5. (a) Test the stability of the control system characterized by the characteristic equation
   $s^4 + 2s^3 + 3s^2 + 4s + 5 = 0.$

(b) A unity feedback control system is described by the characteristic equation $s^4 + 4s^3 + 7s^2 + 16s + 12 = 0$. Test its stability and find the roots on the imaginary axis. [8+8]

6. (a)) Explain the substitution rule. Using the substitution rule, find the amplitude ratio and phase angle for general first and second order systems.

   (b) A control system which is stable for servo operation will be stable for regulator operation also. State true or false and justify the answer. [8+8]

7. What are the applications of Smith Predictor control? Discuss. [16]

8. Discuss an open-loop method of tuning controllers. [16]

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Code No: P0803/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
PROCESS DYNAMICS AND CONTROL
(Chemical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define and prove Initial value theorem.
   (b) Define and prove final value theorem. [8+8]

2. A step change of magnitude 4 is introduced into a system having the transfer function

   $\frac{Y(s)}{X(s)} = \frac{10}{(s^2+1.6s+4)}$

   Determine

   (a) % Overshoot
   (b) Rise time
   (c) Maximum value of Y(t)
   (d) Ultimate value of Y(t)
   (e) Period of oscillation. [16]

3. (a) Give the advantages and disadvantages of pneumatic controllers with electronic controller.
   (b) Define Proportional band and gain of a controller. How they are related? [8+8]

4. Compare the responses to a unit step change in set point for the system shown in the figure 4 for both negative feedback and positive feed back at K_C=0.5. Compare these responses by sketching C(t). [16]

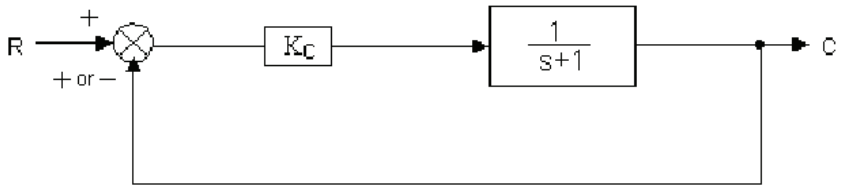

Figure 4

5. Determine the range of values of K (K>0) such that the characteristic equation $s^3 + 3\ (K+1)\ s^2 + (7K + 5)\ s + (4K+7) = 0$ has roots more negative than s = -1. [16]

6. Draw the root locus diagram for the system shown 6, where $G_c = K_c(1+0.5s+1/s)$. [16]

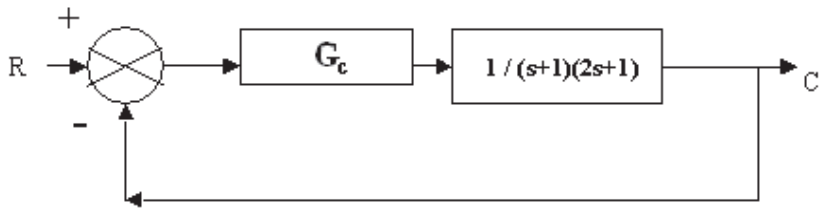

Figure 6

7. What are the applications of Smith Predictor control? Discuss. [16]

8. Discuss the criteria for good control. [16]

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Code No: P1002/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
OPTOELECTRONIC AND LASER INSTRUMENTATION
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Using simple ray theory, describe the mechanism for transmission of light within an optical fiber.
   (b) Briefly discuss with the aid of suitable diagram what is meant by acceptance angle. How is it related to fiber numerical aperture and refractive indices of the fiber core and cladding. [8+8]
2. (a) Describe what is meant by multiple fiber Splicing using a silicon chip array.
   (b) Briefly write about the factors which cause intrinsic losses of fiber joints. [8+8]
3. (a) Describe the important features of a laser beam and compare it with the features of light from an ordinary source of light.
   (b) Explain why it necessary for obtaining amplification of light in an active medium. [8+8]
4. (a) How are fiber - optic sensors classified?
   (b) Suggest a criterion for designing an intensity modulated fiber optical sensor. Explain the factors on which the signals developed by the detector depend on. [8+8]
5. With neat sketchers explain the following applications of lasers in detail.
   (a) Lasers in diagnostics
   (b) Laser in photo medicine. [8+8]
6. (a) With neat sketches explain about holographic interferometers.
   (b) Discuss in detail about holographic computer memories. [8+8]
7. Explain in detail about the following with relevant diagrams
   (a) Lasers in plastic surgery
   (b) Lasers in removal of tumors of vocal cords. [8+8]
8. (a) With the assistance of an equivalent circuit, describe the function and operation of APD device.
   (b) Define photocurrent gain. What are the elements that contribute to photocurrent gain? What is the relationship between reverse biasing voltage and photocurrent gain? [8+8]

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Code No: P1002/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
OPTOELECTRONIC AND LASER INSTRUMENTATION
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Describe with the aid of simple ray diagram, prapagation of light within a
   i. multimode step index fiber
   ii. single mode step index fiber.
   (b) Compare the advantages and disadvantages of these two fiber types for use as an optical channel. [8+8]
2. (a) Derive an expression for coupling efficiency of an LED into a step index fiber.
   (b) Discuss the conditions for efficient light coupling from a source to a fiber.[8+8]
3. (a) Discuss the mechanism of optical feedback to provide oscillation and hence amplification within the laser.
   (b) Discuss how a distinctive spectral output is produced from the laser device. [8+8]
4. (a) Draw and explain the construction and working of Faraday's rotation current monitor.
   (b) What in modulation zone? Draw the basic optical fiber sensor system and explain. [8+8]
5. (a) Explain with relevant diagrams, how lasers are useful in low power measurement.
   (b) With neat sketches explain about laser Doppler velocity meter. [8+8]
6. With necessary diagrams. Discuss in detail about the following:
   (a) Holographic recording materials.
   (b) Recording and reconstruction of fourier transform holograms. [8+8]
7. (a) Explain in detail about laser application in dermatology.
   (b) With neat sketches explain how lasers are useful in plastic surgery. [8+8]
8. (a) Discuss the advantages of PIN photo diode over a PN structure photo diode.
   (b) An APD generates a current of 100mA, when the incident power is 5nw.The operating wave length is 1.5 μm. Find its responsivity. If the quantum efficiency is 0.7. Find the multiplication factor. [8+8]

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Code No: P1002/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
OPTOELECTRONIC AND LASER INSTRUMENTATION
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What is meant by light guidance? Explain about the reflection of ray at a plane boundary.
   (b) Define 'Reflectance' and 'Reflection coefficient'.
   (c) A ray of light enters a glass optical fiber of Refractive index 1.45 surrounded by air. Calculate the angle of incidence greater than which total internal reflection occurs. [8+4+4]
2. (a) Differentiate between the fiber star and tree couplers.
   (b) Discuss the major techniques used in the fabrication of multimode fiber star-coupler. [8+8]
3. (a) Explain Einstein's theory of spontaneous emission and stimulated emission.
   (b) Describe the construction and action of carbon dioxide laser. [8+8]
4. (a) Describe with neat schematic the working of single mode fiber interferometer sensors.
   (b) Discuss about phase and polarization fiber sensors. [8+8]
5. Explain in detail about the following with necessary diagrams
   (a) Lasers in Biomedical applications
   (b) Lasers in Industrial applications. [8+8]
6. With necessary diagrams explain in detail about the following:
   (a) Holographic recording materials.
   (b) Holograms on magnetic tape. [8+8]
7. Explain in detail about the following with relevant diagrams
   (a) Lasers in plastic surgery
   (b) Lasers in removal of tumors of vocal cords. [8+8]
8. (a) Write about the carrier and optical confinement of Double Hetrojunction Laser. How is it different from Homo-Junction laser? Explain.
   (b) Describe the relationship between the threshold current and operating temperature of a laser. Briefly explain. [8+8]

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Code No: P1002/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
OPTOELECTRONIC AND LASER INSTRUMENTATION
(Electronics & Instrumentation Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain in detail about the classification of optical fibers.
   (b) A core of glass surrounded by air satisfies the condition for light guidance. What is the significance of cladding? Explain. [8+8]
2. (a) Briefly describe the types of demountable connector that may be used with single mode fibers.
   (b) Write about the problems involved with the connection of single mode fiber. [8+8]
3. (a) Explain Einstein's theory of spontaneous emission and stimulated emission.
   (b) Describe the construction and action of carbon dioxide laser. [8+8]
4. (a) Describe with neat schematic the working of single mode fiber interferometer sensors.
   (b) Discuss about phase and polarization fiber sensors. [8+8]
5. (a) With neat diagram explain about laser fusion in power plants.
   (b) With necessary diagrams explain how lasers are useful in surgery. [8+8]
6. (a) Discuss about the applications of holograms in manufacturing of integrated circuits in detail.
   (b) With neat sketches explain about recording and reconstruction of volume holograms. [8+8]
7. (a) With neat sketches explain how lasers are useful in medical diagnosis.
   (b) Discuss in detail about lasers and their tissue interaction. [8+8]
8. (a) What is a VCSEL? List the operating characteristic s of VCSEL.
   (b) Derive the expression of threshold current for VCSEL. [8+8]

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Code No: P1202/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
E-COMMERCE
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. What are the major limitations on the growth of e-commerce in India? How do you over come them? [16]
2. Critically evaluate the impact of home entertainment on traditional industries.[16]
3. What is an electronic bill? How does it facilitate e-commerce? [16]
4. Explain how indirect connection EDI through VAN operates with the help of a diagram. [16]
5. What are the advantages and disadvantages of virtual organisatioins? [16]
6. What are the functions of data warehouse? Explain the benefits of data ware house. [16]
7. Explain the probabilistic information retrieval models. [16]
8. Explain the process and procedure of setting up desktop video conferencing [16]

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Code No: P1202/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
E-COMMERCE
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. What is e-commerce? State how e-commerce differ from traditional commerce. [16]
2. What is catalog based shopping? State its advantages. [16]
3. What is Electronic Billing Presentment and Payment system? Discuss the types of EBPP sytems. [16]
4. "EDI has replaced large amount of paper transactions". Elaborate. [16]
5. What is internal commerce? Discuss the forces driving internal commerce. [16]
6. What is Internet advertising? Discuss the methods of Internet advertising? [16]
7. What is consumer search? Explain the process and procedure of consumer search. [16]
8. Discuss 3GPP and IMS. What is the association between the two? [16]

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Code No: P1202/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
E-COMMERCE
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the technology architecture for e-commerce. Also explain the various e-commerce activities. [16]
2. What is an e-market place? Explain the characteristion of an e-market place. [16]
3. What is electronic cash? Explain its properties and advantages. [16]
4. How does EDI work on Internet? What are the roadblocks? [16]
5. What is internal commerce? Discuss the forces driving internal commerce. [16]
6. Compare and contrast internet advertisement and traditional advertisement. [16]
7. Describe the information filtering. What type of data involved in filtering systems? [16]
8. Explain the storage and transmission requirements for multimedia. [16]

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Code No: P1202/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
E-COMMERCE
(Information Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. What is e-commerce? State how e-commerce differ from traditional commerce.[16]
2. What is mercantile transaction? Describe the transactions involved in a simple mercantile protocol. [16]
3. What is electronic cash? Explain its properties and advantages. [16]
4. What is EDI? How does it build up relationship between organizations? [16]
5. "Intra organisational commerce is the way to increase the effectiveness of electronic commerce". Discuss [16]
6. What is the significance of online marketing? State the limitations of on-line marketing? [16]
7. What is consumer search? Explain the process and procedure of consumer search. [16]
8. Describe connection less vs connection-oriented networks? [16]

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Code No: P1301/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
ROBOTICS AND AUTOMATION
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Discuss the assembly operations of industrial robots.
   (b) What are the specifications of robot systems? Explain [6+10]
2. Explain the time of flight range finders with the help of neat sketches. [16]
3. Discuss about stiffness and compliance control of robot manipulators. [16]
4. Discuss the different ways of classifying grippers. [16]
5. (a) Explain the iterative algorithm of Newton-Euler formulation for the manipulator dynamics.
   (b) Derive an expression for the derivative of a time varying rotation matrix with respect to time in terms of a skew-symmetric matrix and itself. [10+6]
6. (a) Find the rotation matrix corresponding to the set of Euler angles XYX and solve the inverse problem to determine the set of Euler angles corresponding to a given rotation matrix $R = \begin{bmatrix} r_{11} & r_{12} & r_{13} \\ r_{21} & r_{22} & r_{23} \\ r_{31} & r_{32} & r_{33} \end{bmatrix}$
   (b) Compute the position (x and y coordinates) for the end of the arm shown in Figure 6b when $a_1 = 8$ units, $a_2 = 6$ units, θ_1=25^o and θ_2=30^o [8+8]

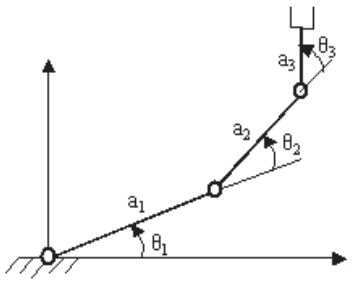

Figure 6b

7. (a) A single cubic trajectory is given by $\theta(t) = 15 + 10\ t - 40t^3$, and is used over a time interval from t = 0 to t = 1 seconds . What are the starting and final positions, velocities and accelerations?
   (b) Explain the limitations of lead-through programming. [8+8]
8. (a) How a welding robot can overcome the problem of variations in the components that are to be welded?

(b) What are the technical and economic problems encountered in applying robots to arc welding? [8+8]

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Code No: P1301/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
ROBOTICS AND AUTOMATION
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain about the Spherical coordinate robot with a neat sketch. Discuss the relative merits and demerits of Spherical coordinate robots. Name any two industrial robots having this geometric structure.
   (b) Discuss about the speed capabilities of current industrial robots. [8+8]
2. Make a list of laminations of two dimension vision systems. [16]
3. Draw the feedback control block diagram of a manipulator with disturbances. [16]
4. What do you mean by mechanical gripper? Explain the two ways of constraining the part in gripper. [16]
5. Consider the manipulator shown in Figure 5. Derive the generalized D'Alemberts equations of motion if m_1 and $m_2$represent the link masses and the length of each link is L units. [16]

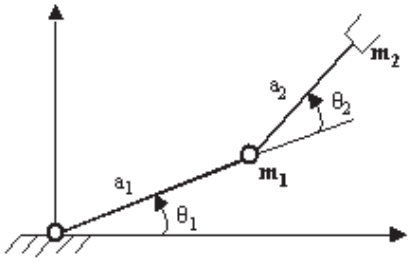

Figure 5

6. Find the direct kinematic equations for the two link planar arm shown in Figure 6. Obtain the solutions for the inverse kinematics. [16]

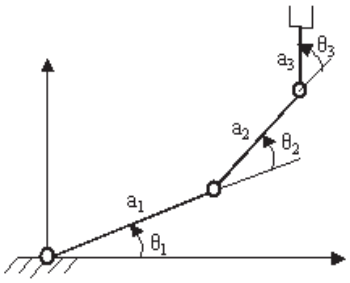

Figure 6

7. Explain the 5-cubic trajectory plan for robot motion. [16]

8. Describe the different types of robot work cell layouts used in robot cell design? [16]

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Code No: P1301/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
ROBOTICS AND AUTOMATION
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Distinguish between soft automation and hard automation.
   (b) Give the classification of industrial robots based on their control systems. Discuss in detail the limited sequence robots and play back robots with point to point control. [8+8]
2. Discuss about hybrid tactile sensors. [16]
3. What are the components of the PUMA robot arm controller? Explain the functions of the controller? [16]
4. Discuss the following methods of actuating the gripper with neat sketches.
   (a) linkage actuation
   (b) gear and rack actuation
   (c) cam actuation. [16]
5. (a) Find the inertia matrix of a right cylinder of homogeneous density with respect to a frame with origin at the center of mass of the body, given the radius and the length of the cylinder as 'a' and 'L'.
   (b) Obtain the expressions for the linear and angular accelerations of a link i. [6+10]
6. (a) Rotate the vector $4\hat{i} - 2\hat{j} - 7\hat{k}$ y an angle of 90 degrees about z-axis.
   (b) A three-link manipulator is shown in Figure 6b. The end of arm is to be positioned at a point defined by x = 3 units and y = 6 units. Determine all the solutions for the angles θ_1, θ_2 and θ_3 if a_1= 4 units, a_2 = 6 units and a_3 = 3 units. [6+10]

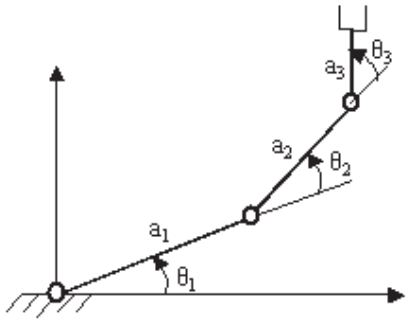

Figure 6b

7. (a) What are the basic elements of second-generation robot languages? Explain.
   (b) What are the limitations of lead through programming? Explain. [8+8]

8. (a) Explain the use of robots in spray coating operations.
   (b) Describe the problems encountered in the use of robots for arc welding applications? [8+8]

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Code No: P1301/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
ROBOTICS AND AUTOMATION
(Electronics & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Define Automation. Distinguish between fixed automation and programmable automation.
   (b) Give the classification of industrial robots based on their control systems. Discuss in detail the play back robots with continuous path control and intelligent robots. [8+8]
2. What are the basic components of vision system? Explain. [16]
3. Explain the hybrid position/force control, and draw the block diagram. [16]
4. Classify the mechanical grippers according to the kinematic device used. [16]
5. (a) Find the inertia matrix of a right cylinder of homogeneous density with respect to a frame with origin at the center of mass of the body, given the radius and the length of the cylinder as 'a' and 'L'.
   (b) Obtain the expressions for the linear and angular accelerations of a link i. [6+10]
6. Find the direct kinematics equation of the four-link closed chain planar arm shown in Figure 6. The two links connected by the prismatic joint are orthogonal to each other. [16]

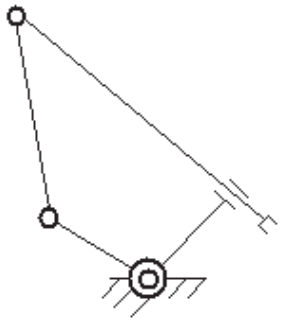

Figure 6

7. (a) A single link robot with a rotary joint is motionless at θ= - 5 degrees. It is required to move the joint in a smooth manner to θ = 80 degrees in 2 seconds and stop smoothly. Compute the parameters of a linear trajectory with parabolic blends.

(b) Differentiate between the robot-level languages and the task-level languages? [10+6]

8. (a) What are the desirable features of a robot for successful machine tool load/unload application?

(b) Describe the applications of a robot in press working operation? [8+8]

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Code No: P1902/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL IMAGE PROCESSING
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Consider the image segment shown below

3	1	2	1(q)
2	2	0	2
1	2	1	1
(p)1	0	1	2

   (a) Let V = {0,1} and compute the D4, D8 and Dm distances between p and q
   (b) repeat for V = {1,2} [16]

2. State and prove following properties of 2D-DFT
   (a) Translation
   (b) Periodicity
   (c) Conjugate symmetry. [6+5+5]

3. Discuss the limiting effect of repeatedly applying a 3X3 low pass spatial filter to a digital Image. You may ignore the border effects. [16]

4. Distinguish between spatial domain techniques and frequency domain techniques of Image enhancement. [16]

5. Explain the Pseudocolor coding approach used when several monochrome images are available, draw the relevant diagram? [16]

6. Explain the following Order-Statistics Filters.
   (a) Max and min filters
   (b) Median filter
   (c) Alpha-trimmed mean filter. [16]

7. (a) Find the edge Detection using function edge
   (b) Explain about Sobel edge Detector. [8+8]

8. (a) Draw and explain a general compression system model.
   (b) Draw the relevant diagram for source encoder and source decoder. [8+8]

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Code No: P1902/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL IMAGE PROCESSING
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Explain the following:
   (a) Arithmetic operations on Images
   (b) Logical operations on Images. [16]
2. Obtain Haar transform matrix for N=8. [16]
3. Discuss Image smoothing with the following
   (a) Low pass spatial filtering
   (b) Median filtering. [16]
4. Distinguish between spatial domain techniques and frequency domain techniques of Image enhancement. [16]
5. Explain the method for converting the values of HIS to RBG. [16]
6. Explain the following Order-Statistics Filters.
   (a) Max and min filters
   (b) Median filter
   (c) Alpha-trimmed mean filter. [16]
7. (a) Explain about Sobel edge Detector.
   (b) Explain about Laplacian of a Gaussian (LoG) Detector. [8+8]
8. (a) Draw and explain a general compression system model.
   (b) Draw the relevant diagram for source encoder and source decoder. [8+8]

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Code No: P1902/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL IMAGE PROCESSING
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) Explain the process of Image acquisition.
   (b) Discuss different elements used in digital image processing system. [8+8]
2. (a) Discuss the concept FWT and draw the flow graph for N=8.
   (b) Compare the FFT and FWT. [10+6]
3. Discuss following techniques for Image enhancement
   (a) Image subtraction
   (b) Image averaging. [16]
4. Give the expression for 2-D Butterworth Low pass filter transfer function and sketch it. Explain its usefulness in Image enhancement. [16]
5. Draw and Explain the schematic diagram of the RBG color cube showing the primary and secondary colors of the light at the vertices Points along the main diagonal have gray values from the black at the origin to white at point (1,1,1).[16]
6. What is Noise? what are the spatial and frequency properties of noise? [16]
7. (a) Explain about Prewitt edge Detector
   (b) Explain about Sobel edge Detector. [8+8]
8. (a) Draw the relevant diagram for a communication system model.
   (b) Explain the noiseless coding theorem. [8+8]

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Code No: P1902/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL IMAGE PROCESSING
(Electronics & Computer Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Distinguish between uniform sampling and non uniform sampling with respect to Images.
   (b) What are the advantages of non uniform sampling. [10+6]
2. Obtain Slant transform matrix for N=8. [16]
3. Discuss following histogram techniques for Image enhancement.
   (a) Histogram specification.
   (b) Local enhancement. [16]
4. Sketch perspective plot of an 2-D Ideal High pass filter transfer function and filter cross section and explain its usefulness in Image enhancement. [16]
5. Explain in detail about the CMY and HIS color spaces. [16]
6. Explain about Adaptive, local noise reduction filter. [16]
7. (a) Write about Roberts edge Detector.
   (b) Explain about Laplacian of a Gaussian (LoG) Detector. [8+8]
8. (a) Can variable length coding procedures be used to compress a histogram equalized image with 2^n gray levels explain
   (b) Can such an image contain interpixel redundancies that could be exploited for data compression? [8+8]

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Code No: P2104/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
COMPUTATIONAL AERODYNAMICS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain briefly finite control volume approach and infinitesimal fluid element approach of models of fluid flow.
   (b) Describe any application of CFD in aerospace engineering. [8+8]

2. (a) Derive the continuity equation $\frac{\partial \rho}{\partial t} + \nabla \bullet (\rho V) = 0$ assuming appropriate flow model. Convert this equation to non-conservation form.
   (b) What are the different types of temperature boundary conditions that are generally prescribed on the surface of a body in viscous flows? [10+6]

3. Write short notes on the following:
   (a) Strong and weak conservation forms of governing equations.
   (b) Shock capturing method. [8+8]

4. Discuss the mathematical and physical behavior of flows governed by hyperbolic equations with an example of steady, inviscid, supersonic flow over a two-dimensional circular-arc airfoil. [16]

5. (a) Explain consistency, convergence, stability criteria.
   (b) Write a short notes on finite difference method with a neat sketch of the spatial discretization. [8+8]

6. What are metrics and derive the relationship between the direct and inverse metrics. [16]

$$i.e. \quad \begin{matrix} \frac{\partial \xi}{\partial x} = \frac{1}{J} \frac{\partial y}{\partial \eta} \\ \frac{\partial \xi}{\partial y} = -\frac{1}{J} \frac{\partial x}{\partial \eta} \end{matrix} \qquad \begin{matrix} \frac{\partial \eta}{\partial x} = -\frac{1}{J} \frac{\partial y}{\partial \xi} \\ \frac{\partial \eta}{\partial y} = \frac{1}{J} \frac{\partial x}{\partial \xi} \end{matrix}$$

7. What are the available structured grid generation techniques and explain elliptic grid generation. [16]

8. Write a short notes on:
   (a) Elliptic grid
   (b) Parabolic grid
   (c) Hyperbolic grid. [5+5+6]

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Code No: P2104/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
COMPUTATIONAL AERODYNAMICS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Compare theoretical, experimental and computational approaches to fluid dynamics bringing out their relative advantages and disadvantages. Will Computational Fluid Dynamics replace the experimental and theoretical approaches? [16]

2. Explain conservation and non-conservation forms of governing flow equations with illustrations from continuity equation. Comment on Integral versus differential form of the governing flow equations. [16]

3. Describe the salient features of methods used to handle shocks in computational fluid dynamics along with their relative merits and demerits. [16]

4. Discuss the mathematical and physical behavior of flows governed by hyperbolic equations with an example of steady, inviscid, supersonic flow over a two-dimensional circular-arc airfoil. [16]

5. Consider the function ϕ (x,y) = e^x+e^y. Consider the point (x,y) = (1,1)
   (a) Calculate exact values of $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at this point
   (b) Use first-order forward differences , with Δx = Δy = 0.1, to calculate approximate values of $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at point(1,1). Calculate the percentage difference when compared with the exact values.
   (c) Use second-order central difference, with Δx = Δy = 0.1, to calculate approximate values for $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at point (1, 1). Calculate the percentage difference when compared with the exact value. [4+6+6]

6. What is the need of transformation of curvilinear, non uniform grid in physical plane to rectangular grid in computational plane? And also explain why the governing equations must be transformed from (x, y) to (ξ, η) as the new independent variables, with suitable derivations for first and second derivatives. [16]

7. Explain O, H, C grid topology with their application. [16]

8. (a) What is hyperbolic grid generation? Explain its advantages and applications.
   (b) How to form hyperbolic grid by using cell area (jacobian) method? [8+8]

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Code No: P2104/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
COMPUTATIONAL AERODYNAMICS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is Computational Fluid Dynamics? Explain the steps involved in the process of Computational Fluid Dynamics.
   (b) Explain the physical meaning of substantial derivative. [8+8]

2. Explain conservation and non-conservation forms of governing flow equations with illustrations from continuity equation. Comment on Integral versus differential form of the governing flow equations. [16]

3. Write short notes on the following:
   (a) Strong and weak conservation forms of governing equations.
   (b) Shock capturing method. [8+8]

4. Write short notes on:
   (a) Domain of dependence and range of influence with an example.
   (b) Well-posed problems. [10+6]

5. (a) Explain about the FDM,FVM, FEM.
   (b) Write difference equation for $\frac{\partial T}{\partial t} = \alpha \frac{\partial^2 T}{\partial x^2}$ [12+4]

6. What are metrics and derive the relationship between the direct and inverse metrics. [16]

$$i.e. \quad \begin{matrix} \frac{\partial \xi}{\partial x} = \frac{1}{J} \frac{\partial y}{\partial \eta} \\ \frac{\partial \xi}{\partial y} = -\frac{1}{J} \frac{\partial x}{\partial \eta} \end{matrix} \qquad \begin{matrix} \frac{\partial \eta}{\partial x} = -\frac{1}{J} \frac{\partial y}{\partial \xi} \\ \frac{\partial \eta}{\partial y} = \frac{1}{J} \frac{\partial x}{\partial \xi} \end{matrix}$$

7. What are the available structured grid generation techniques and explain the conformal mapping method. [16]

8. Write a short notes on:
   (a) Elliptic grid
   (b) Parabolic grid
   (c) Hyperbolic grid. [5+5+6]

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Code No: P2104/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
COMPUTATIONAL AERODYNAMICS
(Aeronautical Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. What is Computational Fluid Dynamics? Illustrate any two aerospace applications of CFD? [16]

2. Explain conservation and non-conservation forms of governing flow equations with illustrations from continuity equation. Comment on Integral versus differential form of the governing flow equations. [16]

3. What are the ways of handling shocks in computational fluid dynamics? Discuss their merits and demerits. [16]

4. Discuss the mathematical and physical behavior of flows governed by hyperbolic equations with an example of steady, inviscid, supersonic flow over a two-dimensional circular-arc airfoil. [16]

5. Consider the function ϕ (x,y) = e^x+e^y. Consider the point (x,y) = (1,1)
   (a) Calculate exact values of $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at this point
   (b) Use first-order forward differences , with $\Delta x = \Delta y = 0.1$, to calculate approximate values of $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at point(1,1). Calculate the percentage difference when compared with the exact values.
   (c) Use second-order central difference, with $\Delta x = \Delta y = 0.1$, to calculate approximate values for $\frac{\partial \phi}{\partial x}$ and $\frac{\partial \phi}{\partial y}$ at point (1, 1). Calculate the percentage difference when compared with the exact value. [4+6+6]

6. What are metrics and derive the relationship between the direct and inverse metrics. [16]

$$i.e. \quad \begin{matrix} \frac{\partial \xi}{\partial x} = \frac{1}{J} \ \frac{\partial y}{\partial \eta} \\ \frac{\partial \xi}{\partial y} = -\frac{1}{J} \ \frac{\partial x}{\partial \eta} \end{matrix} \qquad \begin{matrix} \frac{\partial \eta}{\partial x} = -\frac{1}{J} \ \frac{\partial y}{\partial \xi} \\ \frac{\partial \eta}{\partial y} = \frac{1}{J} \ \frac{\partial x}{\partial \xi} \end{matrix}$$

7. (a) What are the available structured grid generation techniques?
   (b) Explain the algebraic grid generation technique. [8+8]

8. (a) What is hyperbolic grid generation? Explain its advantages and applications.
   (b) How to form hyperbolic grid by using cell area (jacobian) method? [8+8]

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Code No: P2201/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL AND OPTICAL CONTROL SYSTEMS
(Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. Write short notes on:
   (a) Folding
   (b) Aliasing
   (c) Hidden oscillation
   (d) Anti aliasing filter. [16]

2. (a) Consider the discrete time state equation
$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.24 & -1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$
   Obtain the state transition matrix ϕ(k).
   (b) Define similarity transformation. The system matrix 'A' of a discrete time system is given by
$$A = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix}$$
   Compute the state transition matrix A^k using the Cayley-Hamilton theorem. [8+8]

3. Show that the pair {F,G} is completely controllable for all value of α_i's [16]

$$F = \begin{bmatrix} 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \\ \vdots & \vdots & \vdots & \cdots & 1 \\ -\alpha_n & -\alpha_{n-1} & -\alpha_{n-2} & \cdots & -\alpha_1 \end{bmatrix} ; \; G = \begin{pmatrix} 0 \\ 0 \\ 0 \\ . \\ . \\ 1 \end{pmatrix}$$

4. (a) Consider the system described by
   y(k) - 0.6 y(k-1) - 0.81 y(k-2) + 0.67 y(k-3) - 0.12 y(k-4) = x(k)
   where x(k) is the input and y(k) is the output of the system. Determine the stability of the system.
   (b) Consider the following characteristic equation
   $z^3 + 2.1\, z^2 + 1.44\, z + 0.32 = 0$
   Determine whether or not any of the roots of the characteristic equation lie outside the unit circle centered at the origin of the z - plane. [8+8]

5. A discrete-time regulator system has the plant equation
$X(k+1) = \begin{bmatrix} 2 & -1 \\ -1 & 1 \end{bmatrix} X(k) + \begin{bmatrix} 4 \\ 3 \end{bmatrix} u(k)$ and
$y(k) = \begin{bmatrix} 1 & 1 \end{bmatrix} X(k) + 7u(k)$. Design a state feed back control system with $u(k) = -KX(k)$ to place the closed loop poles at $\pm j0.5$. [16]

6. (a) A state feed back control system has following system equations
X(k+1) = GX(k) + HU(k)
Y(k) = CX(k)
U(k) = -KX(k)
where K is state feed back gain matrix
Draw the necessary block diagram for the control system and derive the observer error equation.

   (b) Briefly explain design of digital control systems that must follow changing reference inputs, applying observed-state feed back method. Draw necessary block diagram.

[8+8]

7. If $\dot{x}$= -x+u; x(0) = x^0; x(1) = x^1 find u^* that minimizes $J = \int_0^1 (x^2 + u^2)dt$ [16]

8. Find the points in the three-dimensional euclidean space that extremize the function f(x_1, x_2, x_3) = $x_1^2 + x_2^2 + x_3^2$ and lie on the intersection of the following surfaces.
$x_3 = x_1 x_2 + 5$
$x_1 + x_2 + x_3 = 1$ [16]

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Code No: P2201/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL AND OPTICAL CONTROL SYSTEMS
(Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) What is a sampled data control system? Explain with a neat diagram the sampled data control system using a digital controller.
   (b) If $X(z) = z\{X(n)\}$, then prove $z\{nX(n)\} = -z\frac{d}{dz}X(z)$
   (c) Derive the initial and final value theorems in z-domain [6+5+5]

2. A discrete time system has the following transfer function
   $\frac{Y(z)}{U(z)} = \frac{4z^3-12z^2+13z-7}{(z-1)^2(z-2)}$
   Determine the state model of the system in:
   (a) Phase variable form
   (b) Jordan canonical form. [8+8]

3. Investigate the controllability and observability of the following systems. [16]

   (a) $X(k+1) = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix} X(k) + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(k)$

   $y(k) = [1\ 1]\ x(k)$

   (b) $X(k+1) = \begin{bmatrix} 1 & -2 \\ 1 & -1 \end{bmatrix} X(k) + \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix} u(k)$

   $Y(k) = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} x(k)$

4. (a) Examine the stability of the characteristic equation given by
   $P(z) = z^3 - 1.1\ z^2 - 0.1z + 0.2 = 0$
   (b) A control system has the following characteristic equation
   $P(z) = z^3 - 1.3\ z^2 - 0.08\ z + 0.24 = 0$
   Determine the stability of the system. [8+8]

5. (a) Explain down the design steps for design of digital controller through bilinear transformation using the frequency-domain technique. Draw necessary block diagram for the same.
   (b) State the necessary and sufficient condition for the arbitrary pole placement and explain the same with necessary block diagram for a system with state equation $X(k+1) = GX(k) + Hu(k)$ [8+8]

6. (a) Draw a block diagram for a digital system with a reduced-order observer and explain the same.
   (b) How reduced-order observation is different from minimum-order observation. [10+6]

7. Given $\dot{x} = -x + u : x(0) = x^0, x(2) = x^1$ Find u^* that minimizes $J = \int_0^2 (x^2 + u^2)dt$ [16]

8. Find the points in the three-dimensional euclidean space that extremize the function $f(x_1, x_2, x_3) = x_1^2 + x_2^2 + x_3^2$ and lie on the intersection of the following surfaces.
   $x_3 = x_1 x_2 + 5$
   $x_1 + x_2 + x_3 = 1$ [16]

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Code No: P2201/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL AND OPTICAL CONTROL SYSTEMS
(Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) What is a sampled data control system? Explain with a neat diagram the sampled data control system using a digital controller.
   (b) If X(z) = z {X(n)}, then prove z {nX(n)} = $-z\frac{d}{dz}X(z)$
   (c) Derive the initial and final value theorems in z-domain [6+5+5]

2. A discrete time system is described by the following difference equation
   x(k+2) + 5x(k+1) + 6x(k) = u(k)
   x(0)=x(1)=0, T=1 sec
   (a) Determine the state model in canonical form
   (b) Find the state transition matrix
   (c) For input u(k)=1, k $\geq$ 1, find the output x(k). [5+6+5]

3. (a) State the advantages and disadvantages in controllability and observability.
   (b) What is the need for
      i. Controllability test
      ii. Observability test. [8+8]

4. (a) Consider the system described by
   y(k) - 0.6 y(k-1) - 0.81 y(k-2) + 0.67 y(k-3) - 0.12 y(k-4) = x(k)
   where x(k) is the input and y(k) is the output of the system. Determine the stability of the system.
   (b) Consider the following characteristic equation
   $z^3 + 2.1\ z^2 + 1.44\ z + 0.32 = 0$
   Determine whether or not any of the roots of the characteristic equation lie outside the unit circle centered at the origin of the z - plane. [8+8]

5. (a) Draw a block diagram for a closed loop control system with a single input and state feedback and explain.
   The state equation is
   X(k+1) = GX(k) + HU(k)
   and U(k) = -KX(k)
   (K is state feedback gain matrix)
   (b) Explain Pole placement design methods for a digital control system. [6+10]

6. (a) A state feed back control system has following system equations
   X(k+1) = GX(k) + HU(k)
   Y(k) = CX(k)
   U(k) = -KX(k)
   where K is state feed back gain matrix
   Draw the necessary block diagram for the control system and derive the observer error equation.

   (b) Briefly explain design of digital control systems that must follow changing reference inputs, applying observed-state feed back method. Draw necessary block diagram.

   [8+8]

7. With suitable diagram, explain the terminal time t_1 specified, $X(t_1)$ free problem and derive the necessary conditions of the variational calculus. [16]

8. (a) Briefly explain the objective of an output regulator problem. Give a useful performance measure for the same.

   (b) Explain the objective of a tracking problem. Write down the performance measure for the same. [8+8]

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Code No: P2201/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
DIGITAL AND OPTICAL CONTROL SYSTEMS
(Instrumentation & Control Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Derive the general equation of the modified Z-transform with the block diagram.
   (b) Obtain the modified Z-transform of G(s), where G(s) $=\frac{1}{s+a}$. [8+8]

2. (a) Define
      i. State
      ii. State variables
      iii. State vector
      iv. State space equations
   (b) Discuss in detail the relationship between the s- plane and z-plane. [8+8]

3. (a) State and explain the complete observability of discrete time systems.
   (b) State the condition for complete observability and complete state controllability in the z-plane
   (c) Determine the controllability for the following system
   $$\begin{pmatrix} x_1(k+1) \\ x_2(k+1) \end{pmatrix} = \begin{bmatrix} 0 & 0 \\ -1 & 1 \end{bmatrix} \begin{pmatrix} x_1(k) \\ x_2(k) \end{pmatrix} + \begin{pmatrix} 0 \\ 1 \end{pmatrix} u(k)$$ [5+5+6]

4. (a) Discuss the Liapunov stability analysis for linear time invariant (LTI) discrete time system.
   (b) Determine the stability of the origin of the system given by
   $$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.5 & -1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$ [6+10]

5. (a) Explain down the design steps for design of digital controller through bilinear transformation using the frequency-domain technique. Draw necessary block diagram for the same.
   (b) State the necessary and sufficient condition for the arbitrary pole placement and explain the same with necessary block diagram for a system with state equation $X(k+1) = GX(k) + Hu(k)$ [8+8]

6. Draw a typical block diagram of a digital control system with state observer and explain the same. Write the equation for the control signal in terms of reference signal and observed state vector. [16]

7. Show that the extremal for the functional $J(x) = \int_0^{\pi/2} (\dot{x}^2 - x^2)dt$, which satisfies the boundary conditions $x(0) = 0; x(\pi/2) = 1$ is $x^*(t) = \sin t$ [16]

8. (a) Explain the minimum time problem. Write the performance index for the same. What are the constraints associated with the problem.
   (b) Explain minimum energy problem. [10+6]

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Code No: P2304/R05 **Set No. 1**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION AND PROCESS CONTROL
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A tank of cross sectional area of 2 ft^2 and a linear resistance of R=1ft/ft^3/min is operating at steady state with flow rate of 1ft^3/min. At t=0,the flow varies as shown in the figure 1.
   (a) Determine Q (t) and Q(s). Note that Q is the deviation in flow rate.
   (b) Obtain an expression for H (t) where H is deviation in level.
   (c) Determine H (t) at t=2 and t=infinity. [8+4+4]

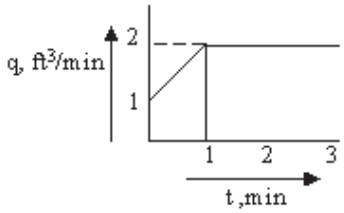

Figure 1

2. (a) Is the thermometer bulb and thermal well arrangement a non-interacting system? Explain.
   (b) With neat sketches explain the non-interacting, interacting dead end and interacting flow systems. [8+8]

3. (a) Explain with analytic expressions the principle of a controller mode which is anticipatory in nature.
   (b) Explain the principle of a hydraulic proportional controller. How proportional gain can be adjusted in this controller. [8+8]

4. (a) Explain the realization of an electronic two position controller with adjustable neutral zone.
   (b) Design an electronic proportional controller for 0-12 V error input, 10% proportional band and 50% zero error controller output. [8+8]

5. A unity feedback system is characterized by an open loop transfer function $G(s) = \frac{k}{s(s+10)}$. Determine the gain 'K' & Determine settling time, peak overshoot & time to peak overshoot for a unit step input. [16]

6. (a) Discuss in brief the frequency response method of process controller tuning with Bode plot.

(b) Differentiate between direct and reverse acting final control operation. [8+8]

7. Write a short notes on

   (a) Valve positioner

   (b) Valve sizing. [16]

8. Write short notes on

   (a) Boiler system

   (b) Distillation column. [8+8]

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Code No: P2304/R05 **Set No. 2**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION AND PROCESS CONTROL
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. A tank of cross sectional area of 2 ft^2 and a linear resistance of R=1ft/ft^3/min is operating at steady state with flow rate of 1ft^3/min. At t=0,the flow varies as shown in the figure 1.
   (a) Determine Q (t) and Q(s). Note that Q is the deviation in flow rate.
   (b) Obtain an expression for H (t) where H is deviation in level.
   (c) Determine H (t) at t=2 and t=infinity. [8+4+4]

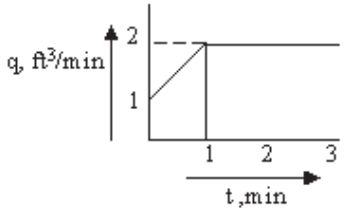

Figure 1

2. (a) Is the thermometer bulb and thermal well arrangement a non-interacting system? Explain.
   (b) With neat sketches explain the non-interacting, interacting dead end and interacting flow systems. [8+8]

3. (a) Explain briefly the proportional, proportional integral and proportional integral derivative control with expressions for transfer functions.
   (b) With a neat sketch, give a comparative study of the responses of above three controller types. [8+8]

4. (a) A proportional derivative controller has the following relation for the proportional action only.
   Deviation, e = -5 to 5 inch.
   Manipulated variable, m = 0 to 1 volt.
   If the derivative time τ_d is 5 seconds and the deviation changes at a rate of +2 inch per minute, how much voltage output is added by the derivative action.
   (b) A hydraulic integral control has an integral time of 0.1 sec When the deviation, e is zero, the piston is at the middle of at 20 inch stroke. Calculate the rate of piston motion if the deviation changes suddenly by
      i. +2 inch and
      ii. by -4 inch. [8+8]

5. What is the phase margin for the recommended controller gain? Explain with graph? [16]

6. Discuss process reaction method for control loop tuning? [16]

7. What is meant by valve positioners? Explain about pneumatic valve positioner. [16]

8. (a) Differentiate between Ratio Control, cascade control & feed forward control.
   (b) What are the applications of Ratio control in a multiloop system [8+8]

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Code No: P2304/R05 **Set No. 3**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION AND PROCESS CONTROL
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. A mercury thermometer having a time constant of 0.1min is placed in a temperature bath at 100^0F and allowed to come to equilibrium with the bath. At time t = 0 temperature of the bath begins to vary sinusoidally about its average value of 100^0F with amplitude of 2^0F. The frequency of oscillation is $10/\pi$ cycles per minute. Calculate the response of the thermometer and phase lag. [16]

2. (a) What is called a dead end system?
   (b) Explain briefly the dead end systems of liquid level process, pressure process and heat flow in thermometer bulb & thermal well processes. [4+12]

3. (a) Discuss the effects of integral controller on the closed loop response of first order systems.
   (b) Explain the principle of derivative control action with neat sketches. [8+8]

4. (a) Explain the realization of an electronic two position controller with adjustable neutral zone.
   (b) Design an electronic proportional controller for 0-12 V error input, 10% proportional band and 50% zero error controller output. [8+8]

5. A proportional integral controller is used on a pure time-delay process. Calculate the response to a step change in load if the controller gain is half the maximum value and the reset time is half the time delay. Calculate the integral of the absolute error. [16]

6. Illustrate with relavant graphs the following methods of optimum settings from the plant response
   (a) Reaction-curve method
   (b) Damped oscillation method [8+8]

7. What is meant by differential gap & how it is related to the performance of the final control element. [16]

8. What is meant by multiloop control system? Explain about feed forward control system with diagram? [16]

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Code No: P2304/R05 **Set No. 4**

III B.Tech II Semester Supplementary Examinations, April 2010
INSTRUMENTATION AND PROCESS CONTROL
(Bio-Technology)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Write a differential equation for the following single capacitance process as shown in the figure 1a:

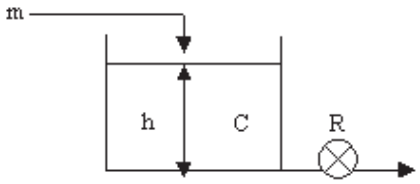

Figure 1a

(b) The above single capacitance level process has a normal operating head of 1.2meters and normal value of outflow of 3375 cubic centimeters per second. The cross sectional area of the vessel is 0.54 sqm. the resistance to the flow is parabolic; determine the time constant of the process. [8+8]

2. (a) Distinguish between interacting and non-interacting systems with examples.

(b) Write the differential equations for the interacting and non-interacting Systems. [8+8]

3. (a) Explain with analytic expressions the principle of a controller mode which is anticipatory in nature.

(b) Explain the principle of a hydraulic proportional controller. How proportional gain can be adjusted in this controller. [8+8]

4. (a) Explain the realization of an electronic two position controller with adjustable neutral zone.

(b) Design an electronic proportional controller for 0-12 V error input, 10% proportional band and 50% zero error controller output. [8+8]

5. Write a short notes on

(a) Pure capacity system

(b) Frequency response analysis [8+8]

6. Explain the detailed procedure for Ziegler-Nichols method PID Settings [16]

7. Write a short notes on

(a) Valve positioner

(b) Valve sizing. [16]

8. Explain with a neat diagram the split range control of the pressure in steam header? [16]

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