(DME 411)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year First Semester)

MECHANICAL ENGINEERING

Paper – I : Industrial Engineering & Management

Time : 3 Hours **Maximum Marks: 75**

Answer any five questions

All questions carry equal marks

1) Suggest measures to improve machine productivity.

2) What are the techniques available to reduce ineffective time?

3) Explain the procedure involved in method study.

4) How is standard time determined?

5) Bring out the use of random number tables for work sampling.

6) State the factors that govern plant location.

7) Enumerate the functions of management.

8) Elucidate the merits and demerits of partnership firm.

9) State the significance of job analysis.

10) Explain the functions of finance.

EEE

(DME 412)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of IVth Year First Semester)

MECHANICAL ENGINEERING

Paper – II : Advanced Machine Design

Time : 3 Hours **Maximum Marks: 75**

Answer question No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) Write short note on the following:

a) Materials used in springs.

b) Different types of clutches.

c) Golden section methods.

d) Minimum deflection for torsion member.

e) Reliability analysis.

UNIT - I

2) A multi-leaf spring with camber is fitted to the chasis of a automobile over a span of 1.2 meter to absorb shocks due to a maximum load of 20kN. The spring material can sustain a maximum stress of 0.4 GPa. All the leaves of the spring were to receive the same stress. The spring should have at least 2 full length leaves out of 8 leaves. The leaves are assembled with bolts over a span of 150 mm width at the middle. Design the spring for a maximum deflection of 50mm.

OR

3) A carriage weighing 25000 N is moving on track with a linear velocity of 3.6 km/hour. If it is brought to rest by two helical compression springs is the from of a bumper by under going a compression of 180 mm. The springs may be assumed to have a spring index of 6 and a permissible shear strength of 450 MPa. Design the spring and determine the

diameter of the wire, mean coil diameter and the length of the spring. Assume the modulus of rigidity of the spring material as 81.4 GPa.

UNIT - II

4) Determine the dimensions of a simple cone clutch to transmit 20 kW at 1000 rpm. The minimum diameter is to be 300 mm and cone angle 20^o. Assume μ = 0.2 and permissible pressure = 0.1 N/mm^2. Also determine the axial force required to engage the clutch.

OR

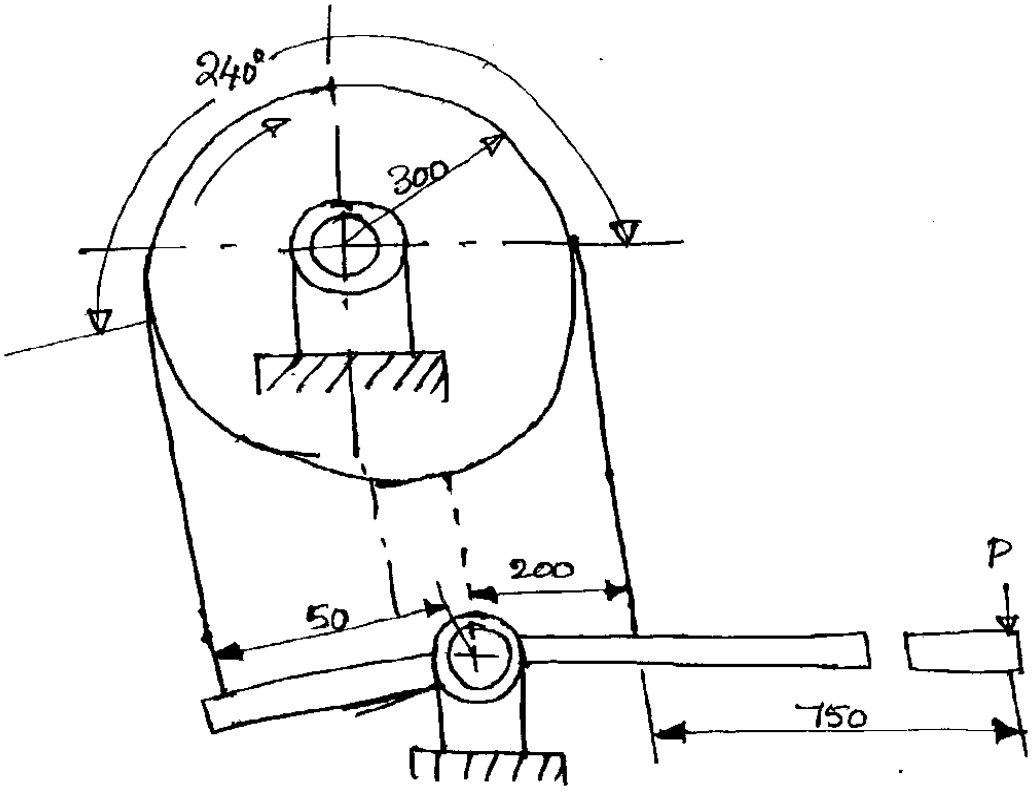
5) A differential band brake is shown in fig, the width and the thickness of the steel band are 100 mm and 3 mm respectively and the maximum tensile stress in the band is 50 N/mm^2. The co-efficient of friction between the friction lining and the brake drum is 0.25 calculate:

a) The tensions in the band

b) The actuating force and

c) The torque capacity of the brake

Check whether the brake is self locking.



UNIT - III

6) Explain the design procedure for a flywheel?

OR

7) Design a cast iron piston for a single acting four stroke diesel engine with the following data.

Cylinder bore = 200 mm, length of stroke = 250 mm, speed = 600 rpm; brake mean effective pressure = 0.60 MPa, maximum gas pressure = 4 MPa, fuel consumption = 0.25 kg per BP per hour, μd ratio for bush in small end of connecting rod = 1.5.

UNIT - IV

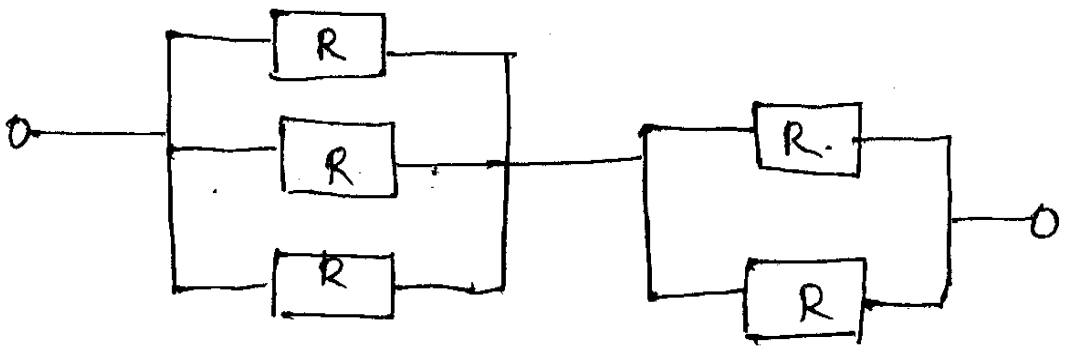
8) a) Explain the system design with suitable example.

b) Write short note on problems encounter in design.

OR

9) a) Discuss the method of achieving reliability.

b) Find out the system reliability.



EEE

(DME 413)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of IVth Year First Semester)

MECHANICAL ENGINEERING

Paper – III : Finite Element Analysis

Time : 3 Hours **Maximum Marks: 75**

Answer question No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) Write a short notes on the following:

a) Venant's principle.

b) Stress – strain relations.

c) Rayleigh – Ritz method.

d) Natural co-ordinates.

e) Four noded quadrilateral element.

f) Scalar field.

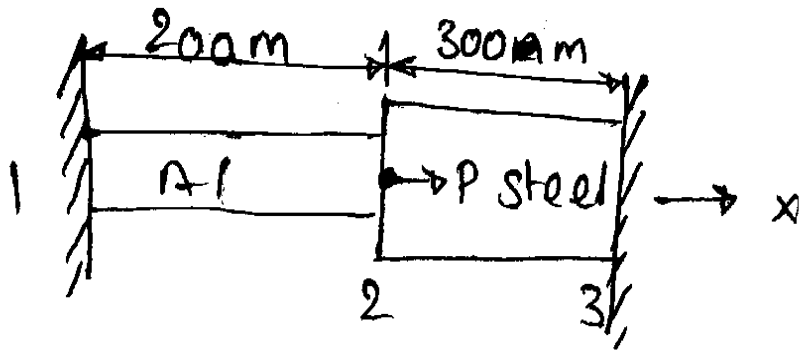
UNIT - I

2) a) Explain the finite element analysis?

b) Define the stiffness matrix for axial members using Galerkine's method.

OR

3) At 20^oC an axial load P $=300x10^3$ N is applied to the rod as shown in figure. The temperature is then raised to 60^oC. Assemble the element stiffness matrix and the element temperature force matrix (F). Again determine the nodal displacements and element stresses. Also find element strains. Assume $E_1 = 70 \times 10^9$ N/m^2, $A_1 = 900$mm^2, $\alpha_1 = 23 \times 10^{-6}$ /^{o}C, $E_2 = 200 \times 10^9$ N/m^2, $A_2 = 1200$ mm^2, $\alpha_2 = 11.7 \times 10^{-6}$ /^{o}C.



UNIT - II

4) a) Explain the local and global co-ordinate systems.

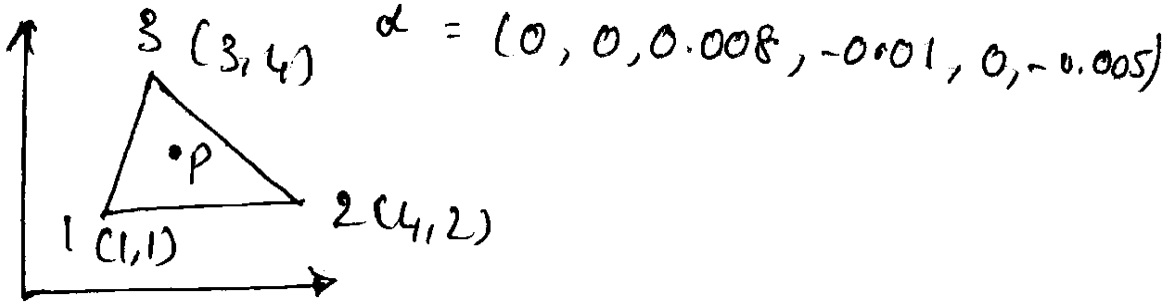
b) Derive the element stiffness matrix.

OR

5) Explain the Galerkin approach of global stiffness matrix.

UNIT - III

6) For the linear triangular element shown in figure obtain matrix B and also determine the strain vector E at the point P.

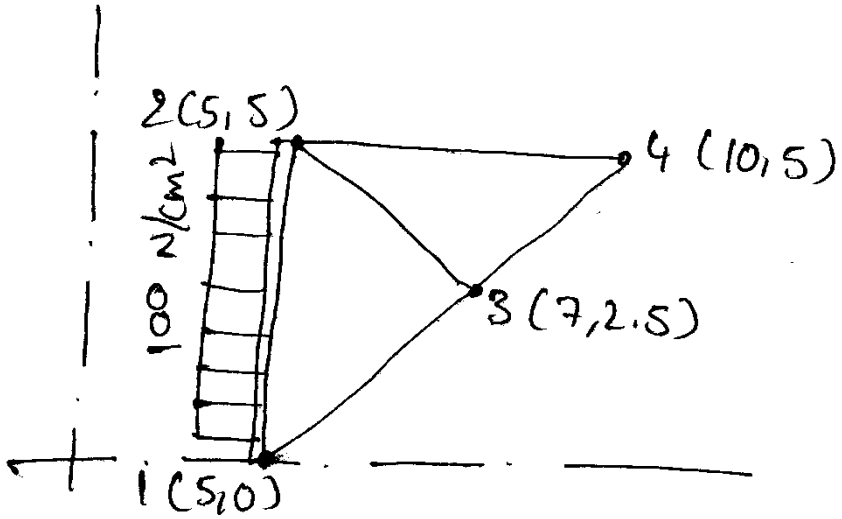


OR

7) Derive an expression for CST.

UNIT - IV

8) Compute stresses in the axi symmetric triangular ring shown in the following figure , using two linear triangular elements. E = 2 x 10^7 N/cm^2, V = 0.25. Also compute the principal stresses and the Von – mises stress.



OR

9 Explain the study state heat transfer problem with governing equation.

EEE

(DME 414)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year First Semester)

MECHANICAL ENGINEERING

Paper – IV : Computer Aided Manufacturing & Automation

Time : 3 Hours **Maximum Marks: 75**

Answerquestion No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) Write a short note on the following:

a) Reason for automating.

b) Applications of LBM.

c) Advantages CNC and DNC.

d) Canned Cycles?

e) What is computer assisted part programming?

f) Benefits of Group Technology.

g) Importance of CIM.

UNIT - I

2) a) Explain the different types of automations with merits and demerits.

b) Briefly the describe about transfer lines.

OR

3) a) Explain the operation of WJM process with neat sketch.

b) Explain the different applications of ECM and EDM.

UNIT - II

4) a) What is NC? Explain the different components of NC.

b) What are the different trends in NC? Explain.

OR

5) a) What is machining centre? Explain its features.

b) Explain the function of CLU of machine control unit.

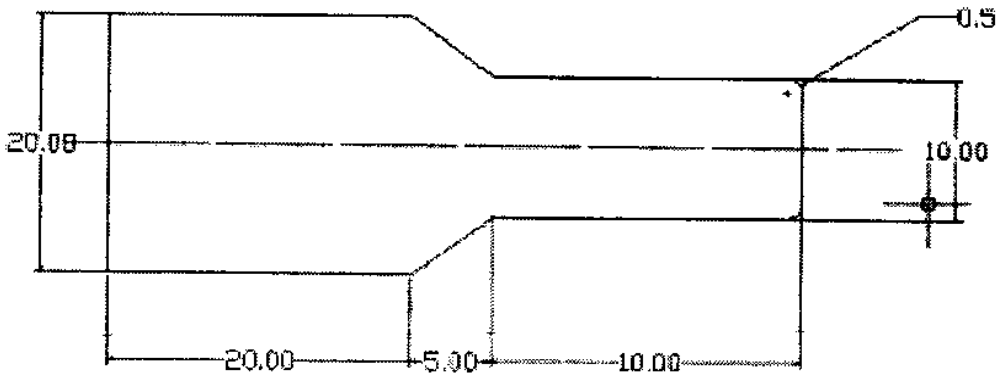
UNIT - III

6) a) Explain the different advancements in part programming using an example.

b) What is tool offset? Explain.

OR

7) a) Write an NC part program for the following part. The raw material size is Φ 25X40 mm long



b) With an example explain the incremental and absolute modes.

UNIT - IV

8) a) List the differences between CAPP and FMS.

b) What is CAPP? Explain the role of CAPP in industry.

OR

9) a) What is the importance of FMS in industry?

b) Explain the benefits of CIM.

EEE

(DME 415)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year First Semester)

MECHANICAL ENGINEERING

Paper – V : Mechatronics

Time : 3 Hours **Maximum Marks: 75**

Answer question No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) a) Define transducer.

b) Mention sensors used for pressure measurement.

c) What is a Sample / Hold circuit.

d) List disadvantages of open loop controllers.

e) What is the use of counters in PLC.

f) Mention four D/A convertors.

g) Give the truth table of NAND and NOR logic gates.

h) Draw two variable Karnaugh map.

UNIT - I

2) a) With examples classify sensors according to their physical measurements.

b) Explain the systems used for testing and calibration.

OR

3) a) Explain the process of analog to digital conversion.

b) How is data acquision carried.

UNIT - II

4) a) Using a block diagram explain hydraulic actuation system.

b) Draw the block diagram of two degree of freedom thermal system and explain its operation.

OR

5) a) A linear motion is used to produce rotatory movement. Justify your answer.

b) Differentiate between time response and frequency response analysis.

UNIT - III

6) a) Explain a proportional controller.

b) Simplify the expression and show that

$$A\,[B + \bar{C}\,(\overline{AB + A\bar{C}}] = AB\,.$$

OR

7) a) Explain in step wise the simplification used in K-maps with the help of a numerical example.

b) Explain a PID controller.

UNIT - IV

8) a) Explain the role of ladder diagrams in PLC.

b) Discuss how data handling is done in PLC.

OR

9 Write short notes on:

a) O/P processing of PLC

b) Pick and place robot

EEE

(DME 416 C)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year First Semester)

MECHANICAL ENGINEERING

Paper - VI : Optimization Techniques

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) a) What is the difference between linear and nonlinear programmes?

b) What is graphical optimization and what are its limitations?

c) What is an inflection point and how do you identify it?

d) State the geometric programming problem model and any one application.

e) State the Kuhn-Tucker conditions.

UNIT - I

2) a) State the linear programming problem in standard form and explain.

b) Food 'X' contains 6 units of vitamin A per gram and 7 units of vitamin B per gram and cost 12 paise per gram. Food 'Y' contains 8 units of vitamin A per gram 12 units of vitamin B and costs 20 paise per grams. The daily minimum requirements of vitamin A and vitamin B are 100 units and 120 units respectively. Formulate LPP.

OR

3) a) Define optimization problem and its elements.

b) Classify optimization problems by various criteria.

UNIT - II

4) a) With the help of a simple problem, demonstrate the principle of golden section method. Highlight its computational efficiency and merits over other methods.

b) Explain with example of gradient search method.

OR

5) a) Explain the optimality criteria for multivariable optimization problems?

b) Find the extreme points of the function $f(x_1,x_2) = x_1^3 + x_2^3 + 2x_1^2 + 4x_2^2 + 6$.

UNIT - III

6) a) How is the degree of difficulty defined for a constrained geometric programming problem.

b) Using arithmetic mean- geometric mean in equality, obtain a lower bound v for the function [$f(x) \geq v$, when v is constant] in $f(x) = 1 + x + \frac{1}{x} + \frac{1}{x^2}$.

OR

7) Explain the stochastic programming model step by step with suitable example.

UNIT - IV

8) Consider the slider crank mechanism and explain its design methodology. Identify the parameters to be optimized and propose the techniques to solve the problem.

OR

9) a) Explain with an example the design of a simple axial.

b) Discuss optimum design of springs.

(DME 416 D)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year First Semester)

MECHANICAL ENGINEERING

Paper - VI : Refrigeration and Air Conditioning

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer one question from each unit ***(4×15 = 60)***

1) a) What is COP of a refrigeration system?

b) Define a Refrigerant. Give five examples of Refrigerants.

c) Write a short note on superheating.

d) What is the function of the rectifier in an absorption system.

e) How can you produce the cold with the vortex tube?

f) When do the DBT, WBT and DPT become equal?

g) What are the factors which affect the human comfort?

UNIT - I

2) a) Give a brief description of an ideal cycle of air refrigeration.

b) A cold storage is to be maintained at -4ºC when the ambient temperature is 34ºC. The heat leakage in the cold storage from surrounding is 30kw. The actual COP is $\frac{1}{3}$ of the ideal COP. Find the power required to run the plant.

OR

3) a) Explain the working of simple air evaporative cooling system used for air crafts?

b) A dense air refrigeration machine operates on reversed Brayton cycle and is required for 10 tons of refrigeration capacity. The cooler pressure is 42 bar and refrigerator

pressure is 1.4 bar. The air is cooled in the cooler to a temperature of 500ºC and the temperature of air at inlet to the compressor is -200ºC. For an ideal cycle, determine the following.

i) COP of the system

ii) Mass of air circulated per minute

iii) Net power per ton of refrigeration.

UNIT - II

4) a) Explain the construction of T-S and p-h diagrams and state why p-h diagram is more suitable for calculations over T-S diagram.

b) A small ice factory produces 30 tons of ice per day from and at 0ºC. The temperature range in the compressor is 25ºC to -15ºC. The vapour is dry and saturated at the end of compression. If the actual COP is 60% of theoretical, find the power required to run the system. Use the following properties of NH_3.

Temp (ºC)	Enthalpy (kJ/kg)		Entropy(kJ/kg-K)	
	h_f	h_g	s_f	s_g
25	100	1320.2	0.348	4.489
-15	-54.6	1305.9	-0.214	5.062

OR

5) a) What are the advantages and disadvantages of capillary tube over other types of expansion devices?

b) Explain the working of a thermostatic expansion valve with the neat sketch.

UNIT - III

6) a) Draw a neat diagram of Li-Br water absorption system and explain its working.

b) What are advantages of absorption refrigeration system over compression refrigeration system.

OR

7) a) What are the merits, limitations and applications of steam jet refrigeration?

b) Explain the working principle of a vortex tube with neat sketch.

UNIT - IV

8) a) Define relative humidity, specific humidity and dew point temperature?

b) 100 m^3 of air per minute at 15ºC DBT and 80% RH is heated until its temperature becomes 22ºC. Find the following:

i) Heat added to the air per min

ii) RH of the heated air

iii) Wet bulb temperature of the heated air

Assume air pressure is 1.033 bar.

OR

9) a) Describe the following types of air filters for cleaning air with simple sketches.

i) Viscous filter

ii) Wet filer.

b) Explain the importance of 'Throw' and 'drop' in locating the grill.

(DME 421)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year Second Semester)

MECHANICAL ENGINEERING

Paper - I : Mechanical Measurements

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4×15 = 60)***

1) Write brief notes on:

a) Measurement system elements.

b) Error Analysis.

c) Optical encoder.

d) Applications of strain gauge.

e) Terms used in pressure measurement.

f) Principle of Torsion meter.

g) Principle of seismic instruments.

UNIT - I

2) Define the following terms:

a) Calibration b) Accuracy

c) Precision d) Sensitivity

e) Resolution f) Standard

g) Repeatability

OR

3) a) What are the different sources of errors in measurements? Explain.

b) List out the dynamic characteristics of the instrument.

UNIT - II

4) a) What are transducers and how are they classified?

b) Describe the principle of operation of a Piezo-Electric transducer. Identify the input and output of the system.

OR

5) a) List and explain the various methods of bridge circuits for measuring strain changes.

b) Explain the principle on which the operation of electrical resistance strain gauge is based.

UNIT - III

6) a) List out the low pressure measuring instruments.

b) Explain with a neat sketch the constructional features and basic working principle of Mcleod gauge used for the measurement of pressure.

OR

7) a) Explain the principle of operation of Hot wire anemometer.

b) Explain the working principle of pyrometers.

UNIT - IV

8) a) Explain the working of pneumatic load cell.

b) Discuss the electrical torsion meter.

OR

9) Explain the principle employed in miscellaneous measurements for the following:

a) Density.

b) Specific gravity.

c) Humidity.

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(DME 422)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year Second Semester)

MECHANICAL ENGINEERING

Paper - II : Computer Aided Design

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4×15 = 60)***

1) Write a short note on the following:

a) Benefits of CAD.

b) Raster scan display.

c) Bresenham's line algorithm.

d) Wire frame modeling.

e) Blending functions.

f) Rotation in transformations.

g) Clipping operation.

h) Cubic splines.

UNIT - I

2) a) List out various input devices for computers. Briefly mention their features.

b) Compare the relative merits and demerits of different input devices.

OR

3) a) Explain the design process in CAD.

b) With suitable sketch discuss the CAD database and its structure.

UNIT - II

4) a) Explain the Bezier circle algorithm.

b) A cubic Bezier curve is defined by the control points as (20, 20), (60, 80), (120, 100) and (150, 30). Find the equation of the curve and its mid point.

OR

5) a) Distinguish between 2D and 3D wire frame modeling.

b) List the entities and explain them in detail.

UNIT - III

6) a) Describe the importance of curve and surface modeling in computer aided graphics and design.

b) Explain the Reparametrisation of surface patch.

OR

7) a) Discuss about various solid modeling techniques.

b) List the applications of solid modeling.

UNIT - IV

8) a) What do you mean by homogeneous co-ordinates and homogeneous transformation matrix?

b) Distinguish between scaling and translation.

OR

9) Explain the clipping and viewing operations.

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(DME 423)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year Second Semester)

MECHANICAL ENGINEERING

Paper - III : Energy Resources Utilization

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4×15 = 60)***

1) a) What do you mean by storage and pondage? Why are they require?

b) Main components of Diesel power plant; Explain.

c) List the basic components of steam generation.

d) Mention the merits and demerits of Fire-tube boilers.

e) Write about Radiation shields.

f) Applications of solar energy.

g) Fuel cells.

UNIT - I

2) a) Discuss the factors which should be considered while selecting a site for a hydroelectric plant.

b) Explain with a neat sketch, essential elements of a hydro electric power plant.

OR

3) a) Explain the necessity of the cooling system in a diesel engine. What are the methods of cooling the engine?

b) Why the power generation by gas turbines attractive these days?

UNIT - II

4) a) How was coal formed? What are the important coal properties relevant to boilers?

b) What is draught? What are the functions of the draught system?

OR

5) a) What is a super critical boiler? What are its merits and demerits?

b) What is the function of an economiser? What are the steaming and non-steaming economisers?

UNIT - III

6) a) Explain the characteristic features of a BWR. What do you mean by external and internal circulation.

b) What is Nuclear Reactor? Explain any one type of Reactor with a neat sketch.

OR

7) a) What are the considerations to be made while selecting the suitable site for a nuclear power plant? Explain.

b) Briefly explain the different methods of pollution control measures on solid waste.

UNIT - IV

8) Explain the principle and operation of non convective solar pond in detail.

OR

9) a) Discuss about the sources of Geothermal energy and their potential in India.

b) Explain about Ocean thermal energy conversion system.

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(DME 424 C)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year Second Semester)

MECHANICAL ENGINEERING

Paper - IV : Robotics

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4×15 = 60)***

1) Write a short note on the following:

a) Robot Anatomy.

b) Control methods for a robot.

c) Interfacing system.

d) Vacuume gripper.

e) Optical Encoder.

f) Torque sensors.

g) Homogenous coordinate system.

UNIT - I

2) a) Define a robot. Also explain what we mean by robot like devices?

b) What are the various criteria for classification of robots? Explain.

OR

3) Explain various industrial and non industrial applications of robots in detail.

UNIT - II

4) a) With a neat sketch explain the magnetic gripper and list its advantages and limitations.

b) How the robot end effector interface is achieved? Explain.

OR

5) a) Explain different types of drive systems used in robots.

b) What are the different types of joints used in robots? Give the degrees of freedom associated with each joint.

UNIT - III

6) a) With neat sketch explain the working principle of Potentiometer and Synchros.

b) Explain the different types of non contact sensors used in robots.

OR

7) a) Explain various types of touch sensor used in robots.

b) Explain briefly about forced oscillation slip sensor.

UNIT - IV

8) a) What is coordinate frame? Explain coordinate reference frames.

b) i) A frame is represented by F = [? 0-1 5, ? 0 0 3, ? – 1 0 2, 0 0 0 1] find the missing values using properties of frame.

ii) A point P = [2 3 4] T is attached to a rotating frame. The frame rotates 90° about the X-axis of the reference frame. Find the new coordinate frame after the rotation.

OR

9) Explain D-H parameters in detail and derive the matrix for forward transformation.

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(DME 424 D)

B.Tech. DEGREE EXAMINATION, DECEMBER – 2015

(Examination at the end of Fourth Year Second Semester)

MECHANICAL ENGINEERING

Paper - IV : Computational Fluid Dynamics

Time : 3 Hours **Maximum Marks: 75**

Answer Question No.1 is compulsory ***(15)***

Answer ONE question from each unit ***(4×15 = 60)***

1) a) Distinguish between conservation and non conservation forms of fluid flow.

b) Listout the advantages of panel method.

c) Elaborate the basic aspects of the finite difference equations.

d) Discuss the need of upwind type discretization.

e) Name the important errors that commonly occurred in numerical solution.

f) Differentiate between surface fitted and body fitted co-ordinate system.

g) What is the importance of CFL condition?

UNIT - I

2) a) Derive continuity equation in differential form for incompressible flow.

b) Derive the energy equation for a viscous flow in partial differential non-conservation form.

OR

3) Write down the elliptic, parabolic and hyperbolic partial differential equations as applicable to computational fluid dynamics.

UNIT - II

4) How do you determine the accuracy of the discretization process? What are the uses and difficulties of approximating the derivatives with higher order finite difference schemes? How do you overcome these difficulties?

OR

5) For the following equation

$$\frac{\partial T}{\partial x} = \alpha \frac{\partial^2 T}{\partial x^2}$$

a) Obtain discretized form of finite difference quotient.

b) Using explicit method, write algebraic equations for 4×4 grid.

UNIT - III

6) Obtain the 2D compressible continuity equation in transformed co-ordinates for transformation $\xi = x, \eta = \ln(y + 1)$.

OR

7) Explain the modern developments in grid generation.

UNIT - IV

8) Describe the Mac Cormak's technique for evaluating the density at time step $(t + \Delta t)$.

OR

9) Explain the CRANK-NICHOLSON technique with suitable example.

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