# Set No. 1

# II B.Tech I Semester Supplimentary Examinations, November 2008 ELECTRICAL AND ELECTRONICS ENGINEERING (Automobile Engineering)

#### Time: 3 hours

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. (a) Define
  - i. e.m.f
  - ii. current
  - iii. Resistance and
  - iv. conductance.
  - (b) Find equivalent resistance between points A and B in the network shown in figure 1b. [6+10]



2. (a) Explain the differences between lap and wave windings.

- (b) Explain the function of the following:
  - i. commutator
  - ii. brushes
  - iii. Field system and
  - iv. armature circuit
- (c) A 6 pole d.c. generator runs at 850 rpm and each pole has a flux of 12 mwb. If there are 150 conductors in series between each pair of brushes? What is the value of generated e.m.f. [4+6+6]
- 3. (a) Explain the working of a single Phase transformer
  - i. On no load and
  - ii. when supplying a lagging power factor load with relevant Phasor diagram.

- Set No. 1
- (b) A 40 KVA, single Phase has 250 Turns on the primary and 50 Turns on the seconding winding. The Primary winding is connected to 3000V, 50Hz mains. Calculate
  - i. Primary and Secondary currents on full load
  - ii. the secondary EMF
  - iii. max flux in the core.

[8+8]

- 4. (a) Explain the principle of operation of a 3-phase induction motor.
  - (b) Explain clearly with necessary circuit diagrams the tests to be conducted on a Three Phase alternator to determine the synchronous impedance of the machine. [6+10]
- 5. (a) Discuss the classification of electrical measuring instruments employed for measurement of current.
  - (b) Explain the significance of controlling torque and damping torque relevant to the Operation of indicating instruments? [6+10]
- 6. (a) Compare the half wave, Full wave and Bridge rectifiers in terms of ripple factor efficiency, PIV and number of diodes.
  - (b) An ac supply of 230V is applied to a half wave rectifier circuit through a transformer of turn ratio 10:1. Find
    - i. the output dc voltage and
    - ii. the peak inverse voltage. Assume the diode to be ideal. [8+8]
- 7. (a) A transistor is connected in common emitter configuration in which collector supply is 8V and the voltage drop across collector resistance 800 ohms is 0.5V. If  $\alpha = 0.96$ , Determine collector emitter voltage and base current and draw the circuit.
  - (b) Compare all the transistor configurations in terms of input, output impedances, voltage gain and frequency. [8+8]
- 8. (a) A cathode ray tube with final anode voltage of 800 volts is kept with its axis vertical. The distance from the final anode to the screen is 24cm. Calculate the deflection of spot due to earth's magnetic field. Assume H = 0.144 A/cm.
  - (b) Explain some applications of CRO in brief. [8+8]



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- (a) Give the formulae to convert delta connected resistances into equivalent stat 1. resistances.
  - (b) Find  $R_{ab}$  across a-b terminals of the network shown in figure 1. [6+10]



- (a) Give the applications of d.c. compound motor. 2.
  - (b) A four pole, 220Vd.c. shunt motor has 540 lap would conductors. It takes 32A from the supply mains and develops power of 5.59 Kw. The field winding takes 1A. The armature resistance is 0.9  $\Omega$  and the flux per pole is 30mwb. Calulate
    - i. the speed and
    - ii. the torque developed in N-m. [6+10]
- 3. (a) Explain the constructional details of a Transformer with neat sketches.
  - (b) The required voltage ratio in a single Phase Transformer is 5000 v/250 v. Supply frequency is 50 Hz. Find the number of turns in each winding if the flux is to be about 0.05 wb. [8+8]
- (a) Discuss in detail, the Pre determination of voltage regulation of an alternator 4. from the open circuit and short circuit test data.
  - (b) A 120 KVA, 3,000 V, single Phase alternator has the following armature parameters.

Resistance =  $0.5 \Omega$ 

Synchronous Reactance  $=10\Omega$ 

(c) Calculate the % Voltage regulation at full load

# Set No. 2

- i. 0.8 pf lag
- ii. 0.9 pf lead
- iii. unity pf.

[6+10]

- 5. (a) Discuss the classification of electrical measuring instruments employed for measurement of current.
  - (b) Explain the significance of controlling torque and damping torque relevant to the Operation of indicating instruments? [6+10]
- 6. (a) Discuss the behavior of a pn junction under forward and reverse biasing.
  - (b) The applied input ac power to a half wave rectifier is 100 watts. The dc output power obtained is 40 watts. What is the rectification efficiency? What happens to remaining 60 watts? [8+8]
- 7. Write a short notes on the following with respect to transistor. [16]
  - (a) Phase reversal
  - (b) dc and ac load lines
  - (c) operating point
  - (d) classification of amplifiers
- 8. (a) How is the electron beam focused to a fine spot on the face of the cathode ray tube?
  - (b) Why is an attenuator probe used for measurements with oscilloscope?
  - (c) What is delayed sweep? Why it is used in oscilloscopes? [6+4+6]

# Set No. 3

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Time: 3 hours

Max Marks: 80

### Answer any FIVE Questions All Questions carry equal marks \*\*\*\*\*

- 1. (a) Give the formula to calculate two inductances connected in series
  - i. aiding and
  - ii. opposing
  - (b) The combined inductance of two coils connected in series is 0.6Hor 0.1H depending on the relative directions in the coils. If one of the coils when isolated has a self inductance of 0.2H, calculate
    - i. mutual inductance
    - ii. coefficient of coupling. [6+10]
- 2. (a) Draw a neat sketch of a d.c. generator and label each part. State the function of each part.
  - (b) A 4 pole d.c. generator with wave wound armature has 51 slots, each having 48 conductors. The flux per pole is 7.5 mwb. At what speed must the armature be driven to give an induced emf of 440V. [8+8]
- 3. (a) Explain with a neat sketches the constructional details of
  - i. Core type and
  - ii. Shell type Transformer
  - (b) A 2000V/200V, 10 KVA Transformer has core loss of 160 w and a full load copper loss of 400 w. Determine
    - i. The efficiency at full load, 0.8 Pf.
    - ii. The efficiency at  $\frac{3}{4}$  full load, unity p.f [8+8]
- 4. (a) Explain the principle of operation of a 3-phase induction motor.
  - (b) Explain clearly with necessary circuit diagrams the tests to be conducted on a Three Phase alternator to determine the synchronous impedance of the machine. [6+10]
- (a) With neat diagram, describe a permanent magnet moving coil instrument and 5. indicate how it can be employed as an Ammeter and as a Voltmeter.
  - (b) A Permanent magnet moving coil voltmeter has the following specifications No. of Turns in the moving coil = 100. Depth of the coil=3ms Width of the coil =2.5 cms Flux density in the air gap =  $0.15 \text{ wb}/m^2$

When the instrument is used for measuring a voltage the moving coil carries a current of 5mA. Calculate the Deflecting Torque produced in the instrument. [8+8]

- 6. (a) With neat sketch explain the working of full wave bridge rectifier? Give its advantages ?
  - (b) In bridge type full wave rectifier, the maximum secondary voltage is 136V.Find the dc load voltage and PIV ? Assume the diodes to be ideal. [8+8]
- 7. (a) Derive an expression for the voltage gain of a transistor amplifier ?
  - (b) In a transistor amplifier, when the signal changes by 0.02V, the base current changes by 10  $\mu$ A and collector current by 1mA. If collector load Rc=5k ohms and  $R_L = 10$ Kohms, find current gain, voltage gain, input impedance and Power gain. [8+8]
- 8. (a) How is the electron beam focused to a fine spot on the face of the cathode ray tube?
  - (b) Why is an attenuator probe used for measurements with oscilloscope?
  - (c) What is delayed sweep? Why it is used in oscilloscopes? [6+4+6]

# Set No. 4

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#### Time: 3 hours

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- 1. (a) Explain
  - i. conductor
  - ii. insulator and
  - iii. semi conductor.
  - (b) A coil consists of 4000 turns of copper wire having a cross sectional area of  $0.8mm^2$ . The mean length per turn is 80cm. The resistivity of copper at normal working temperature is  $0.02\mu\Omega$ . Calculate the resistance of the coil and the power dissipated when it is connected a cross a 230V d.c. supply?

[6+10]

- 2. (a) Write down the voltage equation in
  - i. d.c series motor
  - ii. d.c. shunt motor
  - (b) A 250V, 4 pole wave wound d.c. series motor has 782 conductors on its armature. It has armature and series field resistance of  $0.75\Omega$ . The motor takes a current of 40A. Estimate its speed and gross torque developed if it has a flux per pole of 25 mwb. [6+10]
- 3. (a) Derive the EMF equation of a single Phase Transformer.
  - (b) The maximum flux density in the core of 240/2400 volts, 50 Hz single Phase Transformer is 1.0 weber/sq.m.If the EMF per turn is 8 volts, determine
    - i. The primary and secondary turns and
    - ii. Area of core.
- 4. (a) Explain with neat sketches the construction of 3-phase slip ring induction motor?
  - (b) Explain clearly how to pre determine the voltage regulation of an alternator in a Laboratory by conducting suitable tests? [8+8]
- 5. (a) Explain clearly the methods commonly employed to produce controlling Torque in an indicating instrument. Bring out their relative merits and demerits.
  - (b) Describe the working of a permanent magnet moving coil instrument with a neat sketch. Discuss the possible source of errors in such an instrument and indicate the methods to reduce these errors. |8+8|
- 6. (a) Why are diodes not operated in the breakdown region in rectifier service?

[8+8]



- (b) Why is capacitor filter is preferred than inductor filter in rectifiers?
- (c) What are the limitations of center tap transformer in full wave rectifier?

[4+6+6]

- 7. (a) Explain how an SCR is used to adjust the average power delivered to the load from an ac source.
  - (b) In the Half wave power controller using SCR, the ac voltage of 120V-rms and load resistance of 40 ohms and 1V is dropped across the SCR. When it conducting. Find firing angle if it is desired to deliver an average current of 1A to the load. And also what is the average power delivered to the load under the above conditions. [8+8]
- 8. (a) Why trigger pulse is used in CRO? Give the relationship between the trigger pulse and the sweep in an oscilloscope.
  - (b) Explain how FET and Bipolar transistors are used as Probe for CRO.