Code No: 07A3EC01 **Set No. 1**

II B.Tech I Semester Regular Examinations, November 2008
ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to Civil Engineering, 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) Determine the value of Resistance R and current in each branch when the total current taken by the curcuit in figure 1a is 6 Amps.

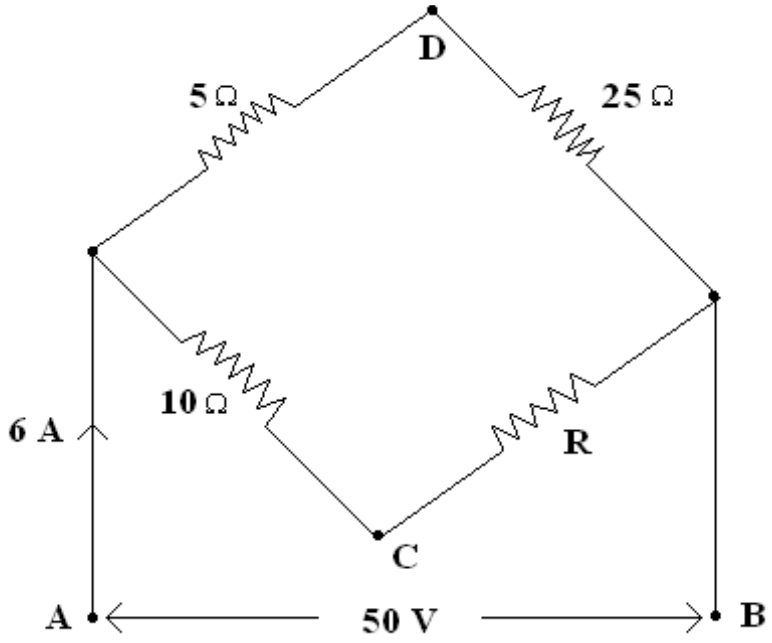

Figure 1a

(b) Differentiate between independent and dependent sources. What is their circuit representation? [8+8]

2. The armature of an 8-pole DC generator has 960 conductors and runs at 400 rpm. The flux per pole is 40 milli weber:

(a) Calculate the induced EMF,if the armature is lap wound.

(b) At what speed should it be driven to generate 400V,if the armature is wave connected. [16]

3. (a) Draw and explain no-load phasor diagram for a single phase Transformer.

(b) A single phase transformer with 10:1 turn ratio and rated at 50 KVA, 2400/240 V, 50 Hz is used to step down the voltage of a distribution system. The low tension voltage is to be Kept constant at 240 V. Find the value of load impedance of the low tension side so that the transformer will be loaded fully. Find also the value of maximum flux inside the core if the low tension side has 23 turns. [8+8]

4. (a) The coil span for the stator winding of an alternator is 120^0 (electrical). Find the chording factor of the winding.
   (b) Compare salient pole and non-salient pole synchronous machines and explain the importance of saliency. [8+8]

5. (a) List the advantages of gravity control over spring control.
   (b) List the different types of materials used in components of spring and gravity control. [8+8]

6. (a) Can an ordinary rectifier diode be used as a Zener diode? Explain with reasons.
   (b) Mention the applications of PN junction diode. [8+8]

7. (a) Explain the input and output characteristics of a transistor in CB configuration.
   (b) Explain the early effect and its consequences. [12+4]

8. (a) Why is magnetic deflection preferred over electrostatic deflection in the CRT used in television?
   (b) Describe the working of a CRO with the help of block diagram. [8+8]

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

Answer any FIVE Questions
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1. (a) When three inductances of values L_1, L_2 and L_3 Henries are connected in series. Prove that $L_{equivalent} = L_1+L_2+L_3$.
   (b) In an A.C circuit, containing pure inductance, the voltage applied is 110V, 50Hz while the current is 10A. Find the value of inductive reactance and inductance.

   [8+8]

2. A 4-pole, long shunt, lap wound generator supplies 25 KW at a terminal voltage of 500 V. The armature resistance is 0.03 ohms, series field resistance is 0.04 ohms and shunt field resistance is 200 ohms. The brush drop may be taken as 1 V. determine:
   (a) the EMF generated
   (b) Cu -Losses & iron Losses
   (c) efficiency at Full Load. [16]

3. A 11000/230 V, 150 KVA, 1- Phase, 50Hz transformer has core loss of 1.4 kW and full load copper loss of 1.6 kW. Determine:
   (a) KVA load for maximum efficiency and value of maximum efficiency at unity power factor.
   (b) The efficiency at half full load 0.8 power factor leading. [16]

4. (a) State the advantages and disadvantages of using short-pitch winding and distributed winding in alternator.
   (b) Deduce the relation between the number of poles, the frequency and the speed of rotation in alternator. [8+8]

5. (a) Explain the different methods of supporting the moving system in instruments.
   (b) Explain the advantages and disadvantages of different damping systems. [8+8]

6. The turns ratio of the transformer used in a half-wave rectifier is 2:1 and the primary is connected to 230 V, 50 Hz power mains. Assuming the diodes to be ideal, determine
   (a) D.C. voltage across the load,
   (b) PIV of each diode and

(c) medium and average values of power delivered to the load having a resistance of 200 Ω.
Also find the efficiency of the rectifier and output ripple frequency. [16]

7. Explain the following:

(a) Firing angle

(b) Conduction angle of an SCR. and

(c) Once the SCR is triggered, the gate looses its control. [16]

8. (a) What happens to an electron when it is exposed to parallel electric and magnetic fields?

(b) In a vacuum diode, the spacing between the parallel plates of cathode and anode is 5 mm and the potential difference is 250V. Calculate the time taken by the electron, with an initial velocity of 1 $\times 10^6$ m/s, to travel from cathode to anode.

[8+8]

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Code No: 07A3EC01 **Set No. 3**

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

Answer any FIVE Questions
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1. (a) Determine the reactance of a 50 μF capacitor in a D.C supply and also in an A.C supply of 100Hz.
   (b) When three inductances of values L_1, L_2 and L_3 Henries are connected in parallel. Find its equivalent inductance. [8+8]

2. Write short notes on the following:
   (a) Classification of DC generators with examples
   (b) Internal & External characteristics of DC generators
   (c) Self excitation mode of DC machine
   (d) Open circuit characteristics of a DC generator. [16]

3. A 200KVA 1-ϕ transformer is in circuit continuously for 8 hours in a day, the load is 160 kW at 0.8 power factor for 6 hours, the load is 80kw at unity power factor and for the remaining period of 24 hours it runs on no-load. Full-load copper losses are 3.02 kW and the iron losses are 1.6 kW. Find all-day efficiency. [16]

4. A 3-phase, 4-pole, 50 Hz induction motor supplies a useful torque of 159 N-m. Calculate at 5 % slip,:
   (a) the rotor input,
   (b) the motor input,
   (c) the motor efficiency if friction and windage losses is 500 W and the stator losses equal to 1000 W. [16]

5. Explain the following terms :
   (a) critically damped
   (b) over damped
   (c) under damped. [16]

6. (a) Describe the phenomenon of diffusion of charge carriers in semiconductors,
   (b) In a P-type semiconductor, the Fermi level lies 0.4 eV above the valence band at 300 ^{0}K. Determine the new position of the Fermi level
      i. at 450 ^{0}K and

ii. if the concentration of acceptor atoms is multiplied by a factor of 2. Assume $kT = 0.03$ eV. [8+8]

7. (a) A sinusoidal voltage $V_i = 200 \sin 314ft$ is applied to an SCR whose forward break down voltage is 150 V. Determine the time during which SCR remains OFF.

   (b) What is the advantages of TRANSISTOR over SCR? [8+8]

8. (a) Compare electrostatic deflection with magneto static deflection.

   (b) In a cathode ray tube having electric deflection system, the deflection plates are 2 cm long and have a uniform spacing of 4 mm between them. The fluorescent screen is 25 cm away from the centre of the deflection plates. Calculate the deflection sensitivity, if the potential of the final anode is

   i. 1000 V
   ii. 2000 V and
   iii. 3500 V [8+8]

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

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1. Find the voltage drop across 1 ohm resistor and power loss across 2 ohm resistor in the figure 1. [16]

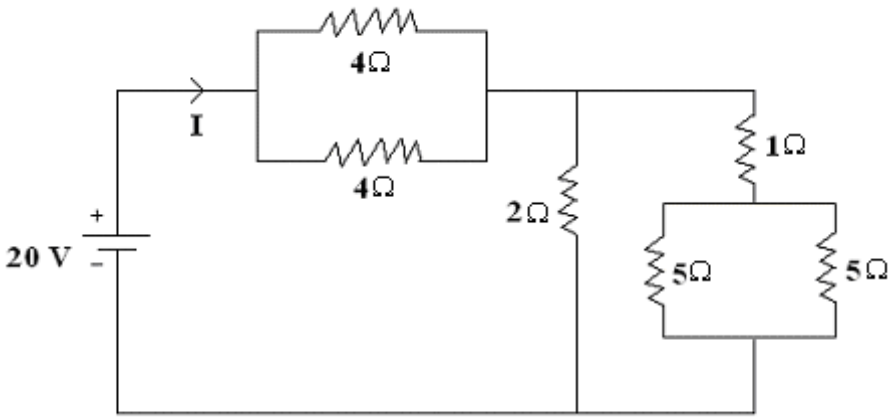

Figure 1

2. Explain in detail about:
   (a) Armature reaction and
   (b) Commutation in DC machine. [8+8]

3. (a) Explain how the losses in transformer vary with the load.
   (b) A single phase 2300/230 V, 50 Hz core type transformer has core section of 0.05 m^2. If the permissible maximum Flux desity is 1.1wb/m^2, calculate the number of turns on primary & secondary sides. [8+8]

4. The data obtained on 100 KVA, 1100V, 3-phase alternator is:
   DC resistance test: E between lines = 6V dc, I in lines = 10 A dc
   O.C test: field current = 12.5 A, Voltage between lines =420V
   SC test: field current = 12.5 A, line current = rated value.
   Calculate the voltage regulation of alternator at 0.8 power factor lagging. [16]

5. (a) Explain the moving coil instruments as ammeters and voltmeters.
   (b) List the advantages of moving coil instruments. [8+8]

6. (a) What is Einstein relationship in a PN junction? Explain the formation of depletion region in a PN junction.

(b) Calculate the conductivity of a pure Silicon at room temperature of 300^0K. Given that $n_i = 1.5 \times 10^{16}$ /m^3 μ_n= 0.13 m^2/V-s μ_p= 0.05 m^2/V-s and q =s 1.6×10^{-19} C. Now the silicon is doped 2 in 10^8 of a donor impurity. Calculate its conductivity if there are 5×10^{28} silicon atoms/m^3. By what factor does the conductivity increases? [8+8]

7. (a) Explain the two types of breakdown in transistors.

   (b) Describe the working principle of an SCR with $V - I$ characteristics. [8+8]

8. (a) What is ion spot in a Cathode Ray Tube using magnetic deflection system?

   (b) Define the " luminous efficiency" of a phosphor used in a Cathode Ray Tube? [8+8]

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