Code No: 07A40203 **R07** **Set No. 2**

II B.Tech II Semester Examinations,December 2010
ELECTRICAL AND ELECTRONICS ENGINEERING
Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A 3-phase, star connected alternator is rated at 1600 KVA,13500 V. The armature resistance and synchronous reactance are 1.5 ohms and 30 ohms respectively per phase. Calculate the percentage regulation for a load of 1280 KW at 0.8 power factor leading.
   (b) Explain the construction and principle of operation of a synchronous-motor. [6+10]

2. (a) Explain the input and output characteristics of a transistor in CB configuration.
   (b) Explain the early effect and its consequences. [10+6]

3. Write short notes on the following with reference to the indicating instruments:
   (a) Fluid friction damping
   (b) Swamping resistance
   (c) Temperature errors
   (d) Gravity control. [16]

4. (a) Explain the open circuit characteristics of DC generators.
   (b) A 4-pole machine running at 1500 rpm has an armature with 90 slots having 6 conductors per slot. The flux per pole is 0.6 mille-Weber's. Determine the induced emf as a dc generator if the coils are Lap connected. If the current per conductor is 100 amperes,determine the electric power output of the machine. [8+8]

5. (a) Calculate the magnitude of frequency of a signal observed on a cathode ray oscilloscope having a time period per cycle of the signal 10 msec.
   (b) What happens to an electron when it is exposed to parallel electric and magnetic fields? [6+10]

6. (a) When two capacitances of values C_1, C_2 Farads are connected in series. Find its equivalent capacitance.
   (b) Find the equivalent capacitance of the combination shown in figure 6b below across X - Y. [6+10]

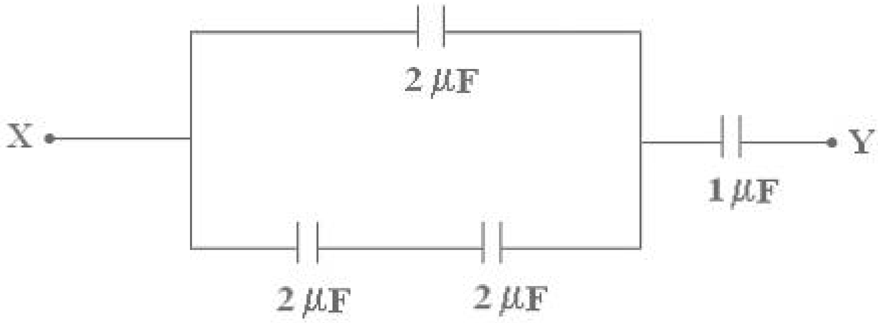

Figure 6b

7. (a) Find the value of D.C. resistance and A.C. resistance of a Germanium junction diode at 25^0 C with $I_0 = 25\ \mu$A and at an applied voltage of 0.2V across the diode.

   (b) Calculate the dynamic forward and reverse resistance of a P - N junction diode when the applied voltage is 0.25 V at T=300 K given $I_0 = 2\ \mu A$. [8+8]

8. A 2000/200 V transformer has primary resistance and reactance of 2 ohms and 4 ohms respectively. The corresponding secondary values are 0.025 ohms and 0.04 ohms. Determine:

   (a) Equivalent resistance and reactance of primary referred to secondary.

   (b) Total resistance and reactance referred to secondary.

   (c) Equivalent resistance and Reactance of secondary referred to primary.

   (d) Total resistance and reactance referred to primary. [16]

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

Answer any FIVE Questions
All Questions carry equal marks
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1. (a) Draw the two transistor model of an SCR and explain its breakdown operation.
   (b) Explain how a transistor act as an amplifier? [10+6]

2. What is armature reaction? Explain the effect of armature reaction on the terminal voltage of an alternator at:
   (a) unity power factor load and
   (b) zero leading power factor load. Draw the relevant phasor diagrams. [16]

3. (a) What is the role of the following in the electro static deflection type CRO. Explain in detail.
      i. Time - base circuit.
      ii. Horizontal deflection system.
      iii. Vertical deflection systems.
   (b) An electron is accelerated from rest by a potential of 150V applied across 4cm distance under vaccum. Calculate the final velocity and the time required for transition. [8+8]

4. (a) What is meant by magnetizing current?
   (b) A single phase 1100V/220V transformer under test gave the following test results:
   OC test - 100V, 0.5 A, 55 Watts.
   SC test - 10 V, 80 A, 400 Watts.
   on LV side HV side short circuited. Calculate the efficiency of the transformer when secondary supplies 100A at 0.8 power factor lag. [6+10]

5. (a) Distinguish between active and passive elements with suitable examples.
   (b) The current in the 5 ohms resistance of the figure 5b is 5A. Find the current in the 10 ohm resistor. Calculate the power consumed by the 5 ohms resistor. [8+8]

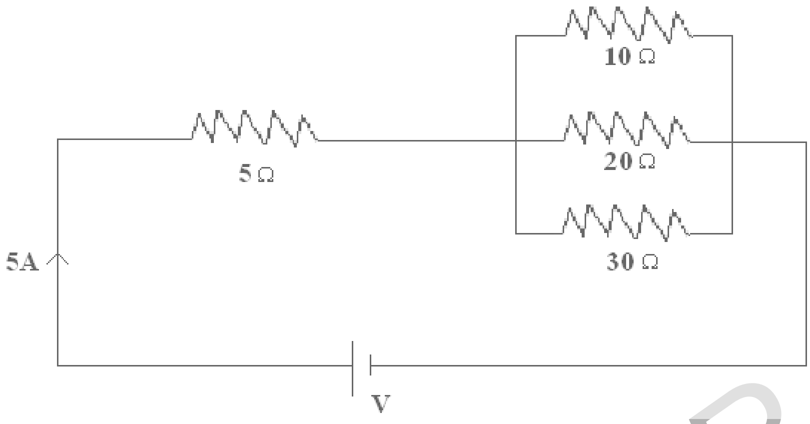

Figure 5b

6. What is meant by doping in a semiconductor? Draw the energy band diagram of a PN junction and explain the working of a diode. Explain how a barrier potential is developed at the PN junction. [16]

7. (a) A 240V, 5A single-phase energy meter has a constant of 1200 rev/KWh. It is tested using a 240 V, 5-A wattmeter having 500 scale divisions which can be read to 0.1 divisions, and a stop watch which can be read to 0.01 and has negligible error. When tested on full load, the meter makes 40 revolutions in 99.8sec. If the human error in timing is taken as 0.05sec, estimate the limits with in which the meter error lies. The wattmeter is accurate to within 0.05% of its full-load reading.

   (b) A moving coil instrument has a resistance of 10 ohms and gives a full scale deflection, while carrying a current of 50 mA. Show how it can be adopted to measure voltages up to 500V and currents upto 50A. [8+8]

8. (a) A 4-pole motor has wave connected armature with 888 conductors. The brushes are displaced backward through 5 angular degrees mechanical from geometrical neutral. If the total armature current is 90 amperes, calculate the cross and back ampere-turns per pole.

   (b) A 250 KW,400 V,6-pole lap connected armature has 720 conductors it is given a brush lead of 2.5 degrees mechanical from its GNA. Calculate demagnetizing and cross magnetizing AT/pole. Neglect shunt field current. [8+8]

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

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1. (a) Explain the effect of temperature on resistance.
   (b) State and explain Ohm's law. With suitable examples.
   (c) What do you mean by potential divider? [6+5+5]

2. Write short notes on the following:
   (a) Turbo (Alternators) generators.
   (b) Armature reaction in synchronous generators
   (c) Determination of efficiency of an alternator
   (d) Cooling of Synchronous machines. [16]

3. (a) Explain the principle of transformer action.
   (b) A single phase transformer has a core whose cross sectional area is 150 cm^2, operates at a maximum flux density of 1.1wb/m^2 from a 50 Hz supply. If the secondary winding has 66 turns, determine the output in KVA when connected to a load of 4 ohms impedance. Neglect any voltage drop in the transformer. [8+8]

4. (a) Describe the method of electrostatic focusing in a cathode ray tube?
   (b) Write any four applications to CRO.
   (c) Mention the source of electrons in a cathode ray tube. [8+4+4]

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. (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) For a P-N-P transistor operating in the active region, draw a diagram indicating the various electron and hole current components crossing each junction and entering (or leaving) the base terminal.

(b) Which Current components are proportional to the gradient of n_p at J_E and J_C?

(c) Which current components are proportional to the gradient of P_n at J_E and J_C?

(d) Indicate the sources of origin of the various current components crossing the base terminal. [16]

8. (a) A series motor of resistance 1 ohm between terminals runs at 1000 rpm at 250 V with a current of 20 A. Find the speed at which it will run when connected in series with a 6 ohm resistance and taking the same current at the same supply voltage. [16]

(b) A belt driven DC shunt generator runs at 1500 rpm delivering 10KW at 220 V brushes. The belt breaks, following which the machine operates as a motor drawing 2KW power. What will be its speed as motor? The armature and field resistances are 0.25 ohms and 55ohms respectively. Ignore armature reaction and assume the contact drop at each brush to be 1 volt . [8+8]

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Code No: 07A40203 **R07** **Set No. 3**

II B.Tech II Semester Examinations,December 2010
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Aeronautical Engineering

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

Answer any FIVE Questions
All Questions carry equal marks

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

2. What are the different types of ac generators in use. Explain the essential differences in their construction. [16]

3. (a) Explain the process of voltage build up in a DC shunt generator. What is critical field resistance?
   (b) A 4-pole DC shunt generator with wave connected armature has 41 slots and 12 conductors per slot. The armature resistance is 0.5 ohms and the shunt field resistance as 200 0hms and flux per pole is 125 m webers. When the generator is driven at 1000 Rpm, calculate the voltage across a 10 ohms resistance connected across the armature terminals. [8+8]

4. (a) Explain the term current density. Obtain the expression for current density 'J' in terms of dimensions of the conductor, velocity and carrier concentration of charge carrier. [16]
   (b) Derive the expression for transit time τ (tow) and final velocity V in the case of an electron traversing in uniform electric field E. [6+10]

5. (a) Distinguish between power efficiency and all-day efficiency of a transformer.
   (b) The no-load current of transformer is 5A at 0.2 power factor, when applied at 240V, 50 Hz. The number of turns on the primary winding is 250. Determine:
      i. The maximum value of flux in the core.
      ii. The core loss and
      iii. Magnetizing current. [8+8]

6. (a) Derive an expression for ripple factor in a full-wave rectifier with resistive load.
   (b) Determine the value of ripple factor in the full-wave rectifier operating at 50 Hz with a 100^0F capacitor filter and 100 Ω load. [8+8]

7. Find the total current and power consumed by the circuit in figure 7 for the given source of 40 volts. [16]

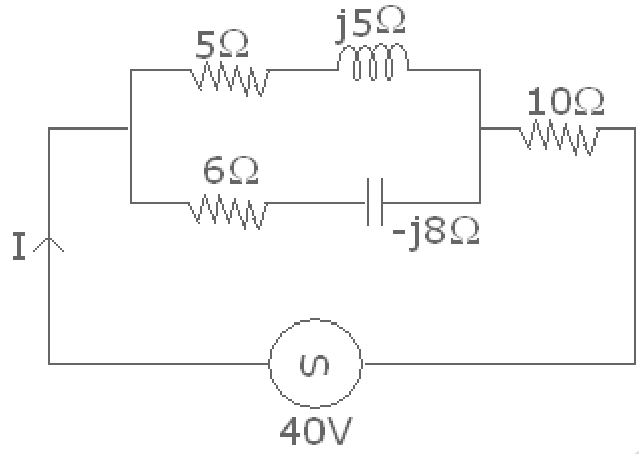

Figure 7

8. (a) Write the Ebers-Moll equations for a transistor.

   (b) Define the terms emitter efficiency and the base transport factor β^*. How are these related to transistor α? [8+8]

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