Code No: 07A1EC07 **Set No. 1**

I B.Tech Supplimentary Examinations, Aug/Sep 2008
BASIC ELECTRICAL ENGINEERING
(Common to Computer Science & Engineering, Information Technology and Computer Science & Systems Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) A copper wire of diameter 1cm has resistance of 0.15Ω. It was drawn under pressure so that its diameter was reduced to 50%. What is the new resistance of the wire?
   (b) State and explain Faradays law of electromagnetic induction. [10+6]
2. (a) Give a detailed comparison of series and parallel circuit.
   (b) What are the applications, merits and demerits of a series circuit?
   (c) What are the applications and advantages of a parallel circuit? [6+5+5]
3. (a) In a parallel magnetic circuit, derive the expression of total mmf required.
   (b) An iron ring 100 sq.cm mean circumference and of cross sectional area 5 sq.cm has a saw cut of 2mm length. It is wound with 500 turns of wire. If 0.5 mwb flux exists across the air gap, what will be the value of the exciting current? Take coefficient of leakage=1.26 and relative permeability of iron = 5 00. [6+10]
4. (a) A coil of 20 ohms resistance has an inductance of 0.2 H and is connected in parallel with a 100 μF capacitor. Calculate the frequency at which the circuit will act as a non-inductive rsistance. Find also the value of that resistance at which the circuit will act as a non-inductive resistance.
   (b) An AC circuit consists of two parallel branches. Branch 1 consists of a coil having R=20 Ω and L=0.1H. Branch 2 consists of a coil having resistor in series with 60 μF capacitor. Calculate
      i. The current in each branch
      ii. The line current
      iii. The power, when the circuit is connected to 230 V supply having a frequency of 50Hz.
      iv. Resistance
      v. Inductance of a single coil which will take the same current and power from the same supply. [8+8]
5. A 1 phase transformer has 500 turns on the primary and 40 turns on the secondary winding. The mean length of the magnetic path on the core is 150 cm and the joints are equivalent to an air gap of 0.1mm. When the potential difference of 3000V is applied to the primary, the max flux density is 1.2 T. Calculate

(a) The cross sectional area of the core

(b) No load secondary voltage

(c) The no load current drawn by the primary

(d) Power factor on no load given that ampere turns per cm for a flux density of 1.2 T in the iron to be 5, the corresponding iron loss to be 2W/Kg at 50Hz and density of iron as 7.8 gm/cm^3. [4+4+4+4]

6. (a) Derive the expression for the armature torque and shaft torque of a DC motor.

(b) The armature of a 6 pole, DC shunt motor takes 300 A at the speed of 400 revolutions per minute. The flux per pole is 75 mWb. The number of armature turns is 500. The torque lost in windage, friction and iron losses can be assumed a 2.5%. Calculate [6+10]

i. Torque developed by the armature

ii. Shaft torque

iii. Shaft power in KW.

7. (a) Explain the revolving field type and the revolving armature type alternators.

(b) A 6 pole DC generator is running and producing a frequency of 60 Hz. Calculate the revolutions per minute of the generator. If the frequency is decreased to 20 Hz, how many number of poles will be required if the generator is to be run at the same speed.

(c) Give the difference between a DC generator and an alternator. [6+6+4]

8. What are the basic requirements of indicating instrument? Briefly discuss them. [8+8]

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

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1. Find the current through and the voltage across all the elements in the circuit by applying Kirchoff's laws as shown in the figure 1. [16]

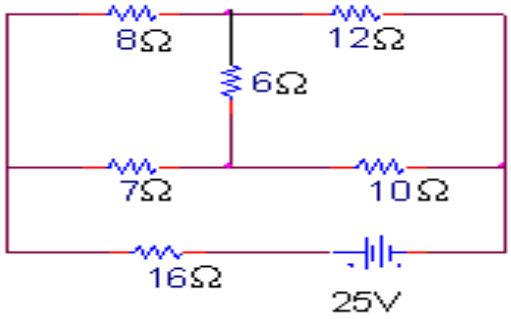

Figure 1

2. (a) Find the equivalent resistance between the terminals X and Y in the circuit as shown in the figure 2a.

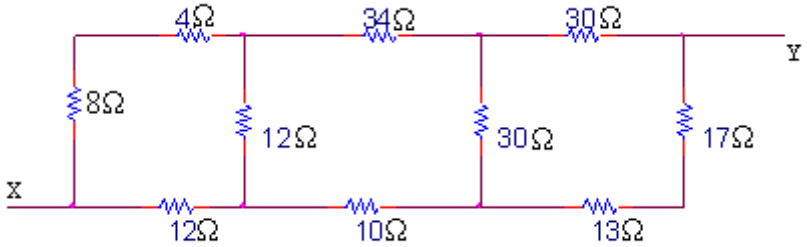

Figure 2a

(b) Describe in detail the steps to apply Thevenin's theorem. [12+4]

3. (a) Explain as to what you understand by:
   i. Static
   ii. Dynamic inducement of electromotive force. Illustrate by the help of simple sketches.

   (b) A coil of 100 turns is linked by a magnetic flux of 20mwb. If this magnetic flux is reversed in a time of 2ms, calculate the average emf induced. [6+10]

4. Three impedances Z1=10+j31.4 Ω, Z2 = 6+j8 Ω, and Z3 = 3-j4 Ω are connected in parallel across a 200V AC supply. Calculate

   (a) Total admittance, conductance and susceptance of the whole circuit.

(b) Total current, power factor and power. [8+8]

5. (a) Explain the principle of working of a single phase transformer.
   (b) Derive from the first principles, the emf equation of a single phase transformer. [8+8]

6. (a) What is the function of a commutator in a DC machine? Discuss with relevant figures.
   (b) Differentiate between slip rings and commutator.
   (c) A 4 pole wave wound DC generator has 50 slots and 24 conductors per slot. The flux per pole is 10 mWb. Determine the induced emf in the armature if it is rotating at a speed of 700rpm. [3+3+10]

7. (a) Give the difference between an induction motor and a transformer.
   (b) A 12 pole, 3 phase alternator driven at 500 rpm supplies power to a 8 pole 3 phase induction motor. If slip of motor at full load is 3%, calculate the speed of the motor.
   (c) A 3 phase induction motor has starting torque of 100% and a maximum torque of 200% of the full load torque. Find slip at maximum torque. [4+6+6]

8. (a) Give a comparison of spring control and gravity control.
   (b) Explain the errors occurring in a moving iron instrument. [8+8]

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Code No: 07A1EC07 **Set No. 3**

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

Answer any FIVE Questions
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1. (a) A 100W, 250V bulb is put in series with a 40W, 250V bulb across a 500V supply. What will be the power consumed by each bulb? Will such a combination work?
   (b) State and explain Kirchoff's current law and voltage law. [10+6]

2. Determine the power loss in the 10Ω resistor by using Thevenin's theorem as shown in figure 2. [16]

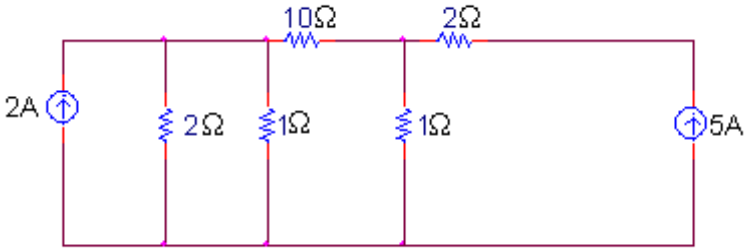

Figure 2

3. Define the following:
   (a) Magnetic field
   (b) Magnetic circuit
   (c) Magnetic flux
   (d) Magnetic flux density
   (e) MMF
   (f) Reluctance
   (g) Magnetic field strength
   (h) Permeability. [16]

4. (a) A coil of power factor 0.9 is in series with a 120 μF capacitor. When connected to a 50 Hz supply, the potential difference across the coil is equal to the potential difference across the capacitor. Find the resistance and inductance of the coil.
   (b) A metal filament lamp rated 750 W, 110V is to be connected in series with a capacitor across a 220V, 50Hz supply. Calculate
      i. The capacitance required

ii. The power factor. [8+8]

5. The iron and full load copper loss in a 40KVA 1 phase transformer are 450 W and 850 W respectively. Find
   (a) Efficiency at full load when the power factor of the load is 0.8 lagging
   (b) The maximum efficiency and
   (c) The load at which the maximum efficiency occurs. [8+8]
6. What are the main parts of a DC machine? State the function of each part with relevant figures. [6+10]
7. A 4-pole, 50 Hz, three phase induction motor has rotor resistance and reactance of 0.025 Ω and 0.02 Ω per phase respectively. Determine
   (a) The value of speed at which the maximum torque occurs
   (b) The value of the external rotor resistance per phase to be inserted to obtain 60% of the maximum torque at the starting. [16]
8. What do you understand by attraction type and repulsion type instruments? Explain. [8+8]

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Code No: 07A1EC07 **Set No. 4**

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

Answer any FIVE Questions
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1. (a) Six resistors are connected as shown in figure 1a. If a battery having an emf of 30V and an internal resistance of 2Ω is connected to terminals A and B. Find
   i. current from battery
   ii. potential difference across 10Ω and 12Ω.

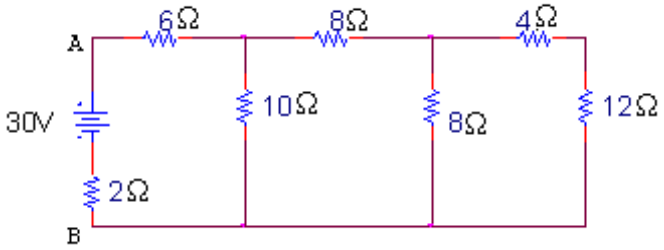

Figure 1a

   (b) Find the effective resistance of the following combination of resistances and the voltage drop across each resistance when the applied voltage is 70V across P and Q as shown in figure 1b. [8+8]

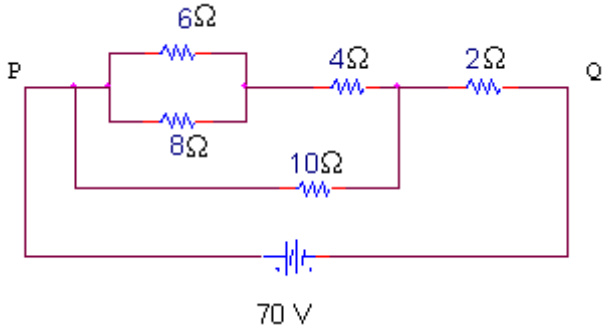

Figure 1b

2. (a) Give a detailed comparison of series and parallel circuit.
   (b) What are the applications, merits and demerits of a series circuit?
   (c) What are the applications and advantages of a parallel circuit? [6+5+5]

3. Define the following:
   (a) Magnetic field
   (b) Magnetic circuit

(c) Magnetic flux

(d) Magnetic flux density

(e) MMF

(f) Reluctance

(g) Magnetic field strength

(h) Permeability. [16]

4. (a) Explain the behaviour of AC through R-C series circuit.

   (b) A resistor carries two alternative currents having same frequency and phase and having the same peak value of 20A. One is sinusoidal and the other is rectangular in waveform. Find the RMS value of the resultant current.[6+10]

5. (a) A 3000/300V 1 phase transformer gives 0.6A and 60W as ammeter and voltmeter reading. When supply is given to the low voltage winding, the high voltage winding is kept open. Find

      i. Power factor of no load current

      ii. Magnetizing current

      iii. Iron loss component.

   (b) Write a note on various winding parameters of a transformer.

   (c) Define regulation stating an expression to obtain it. [10+3+3]

6. (a) A short shunt compound generator supplied 7.5 KW at 230 V. The shunt field, series field and armature resistances are 100 Ω, 0.3 Ω and 0.4 Ω respectively. Calculate the induced emf and the load resistance.

   (b) Write down the similarities and dissimilarities between motors and generators.

   (c) Explain the motoring and generating actions of a DC machine. [6+5+5]

7. A 3 phase, 50Hz induction motor has a starting torque which is 1.25 times full load torque and a maximum torque which is 2.5 times full load torque. Neglecting stator resistance and rotational losses and assuming rotor resistance, find

   (a) Slip at full load

   (b) Slip at maximum torque

   (c) Rotor current at starting in per unit of full load rotor current. [16]

8. (a) Differentiate between moving coil and moving iron instrument.

   (b) Explain with neat sketch the air friction damping. [8+8]

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