Code No: Z0521 / R07 **Set No. 1**

I B.Tech - Regular Examinations, June 2009
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) 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.

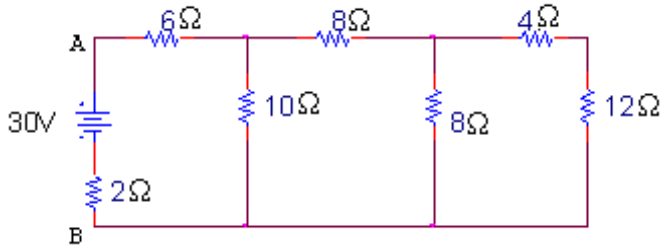

Figure 1a

   (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]

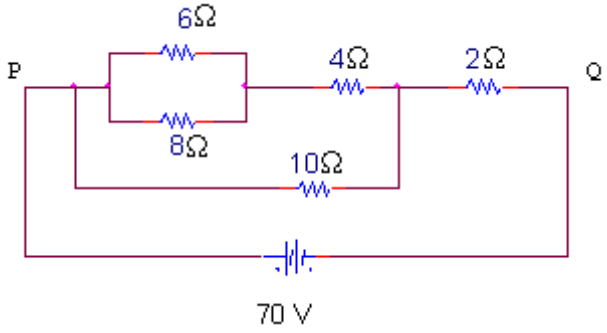

Figure 1b

2. Find the voltage across AB by using superposition theorem as shown in figure 2. [16]

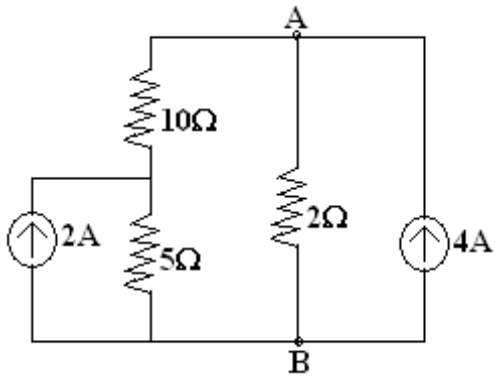

Figure 2

3. (a) A coil of 500 turns is wound on a wooden former and a current of 7A produces a magnetic flux of 30mWb. Calculate the inductance of the coil and induced emf when the current is reversed in 0.01sec.

   (b) The no of turns in a coil is 300. When a current of 4A flows in this coil the flux in the coil is 0.06mWb. When this current is reduced to 0 in 4ms the voltage induced in a coil lying in the vicinity of the coil is 70V. If the coefficient of coupling between the coil is 0.9, find self inductance of the two coils, mutual inductance and no of turns in the second coil. [6+10]

4. Explain the behaviour of AC through

   (a) Pure R

   (b) Pure L

   (c) Pure C circuits

   For each case, derive the instantaneous value of V and I, Impedance, Average power, Power factor, Instantaneous power and the relevant phasors. [5+5+6]

5. Calculate the efficiency at full load, half load and 1/4 th load at

   (a) unity power factor

   (b) 0.71 power factor lagging for a 80KVA ,1100/250V , 50Hz , 1 phase transformer whose losses are as follows.: iron loss = 800W, total copper losses with 160A in the low voltage winding is 200W. [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. Discuss the necessity of damping torque in indicating instrument. Explain with neat sketch the different methods of producing them. [8+8]

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1. (a) Explain in detail how a magnetic field is produced due to the electric current.
   (b) By applying kirchoffs law, find the current through all the elements in the circuit asc shown in the figure 1. [4+12]

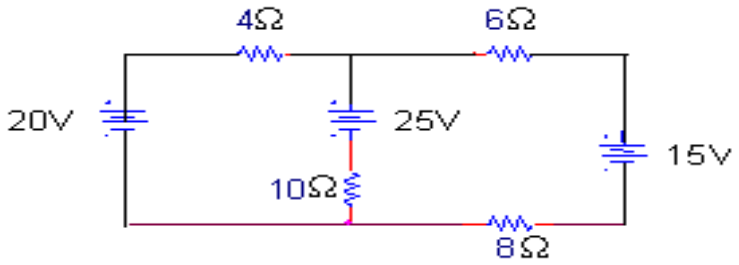

Figure 1

2. Calculate the current through 2+j3Ω impedance by superposition theorem as shown in figure 2. [16]

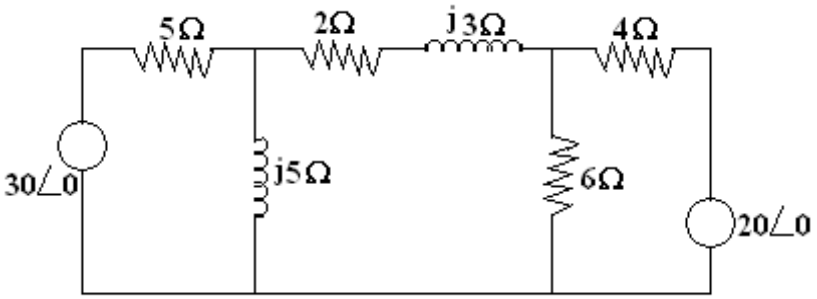

Figure 2

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. An inductive coil of resistance 12 Ω and inductance 0.0398 H is connected in parallel with a capacitive branch having resistance of 20 Ω and capacitance of 265.2 μF. The combination is connected across 220 V, 40 Hz mains. Calculate the total current

taken by the combination. It is desired to raise the power factor of the combination as such a capacitor of capacitance 67.5 μF is connected in parallel with the above combination. Find the power factor of the resultant circuit. [8+8]

5. A 20 KVA , 2000/200V transformer has an iron loss of 300W and full load copper loss of 400 W. During the day it is loaded as follows:

No of hours	Load	Power factor
8	1/4	0.5
6	full load	0.8
6	3/4	unity
4	no load	-

Find the all day efficiency [16]

6. (a) How is the efficiency of the dc motor determined by the direct loading method? Derive the equation for efficiency.
   (b) In a brake test on a dc shunt motor full load readings are as follows. Tension on tight side is 9.1 Kg, tension on slack side is 0.8 Kg. Total current is 10 A, supply voltage is 110V, speed is 132 rpm, effective radius of the pulley is 7.5 cm. Calculate its full load efficiency. [8+8]

7. A 3 phase, 4 pole 50 Hz induction motor at standstill has 120 V induced across its star connected terminals. The rotor resistance and standstill reactance per phase are 0.2 Ω and 0.1Ω respectively. Calculate the speed when the rotor is drawing a current of 16 A at a particular load. Also calculate the speed at which the torque is maximum and the corresponding value of the rotor. [8+8]

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

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

Answer any FIVE Questions
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1. Determine the power output of each voltage source using kirchoffs laws for the network as shown in figure 1. [16]

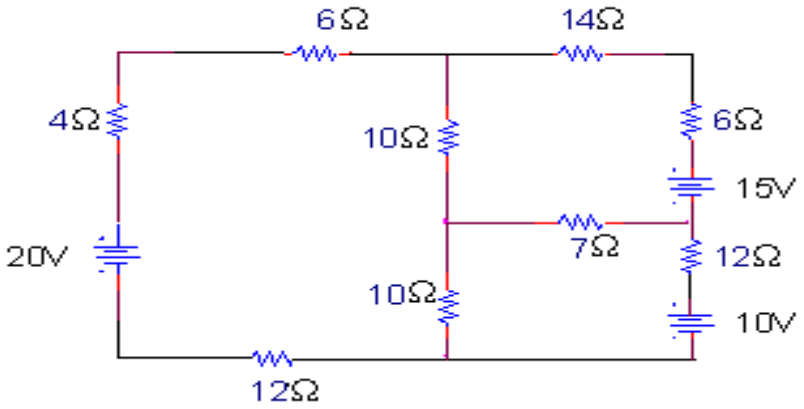

Figure 1

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) State and explain faraday's laws of electromagnetic induction.
   (b) Write short notes on Lenz's law.
   (c) A coil of 1000 turns of wire uniformly wound on a non-magnetic ring of mean diameter 40 cm and cross-sectional area 20 sq.cm. Calculate
      i. The inductance of the coil.
      ii. The energy stored in the magnetic field when the coil is carrying a current of 15A.
      iii. The emf induced in the coil if this current is completely interrupted in 0.01 second. [5+3+8]

4. An inductive coil of resistance 20 Ω and reactance 31.4 Ω is connected in parallel with a capacitance of 72.1 μF across a 100 V, 50Hz supply. Find the total current, power factor, power absorbed. Draw the phasor diagram of the circuit. [4×4]

5. (a) A 400/200V single phase transformer is supplying a load of 50A at a power factor of 0.866 lagging. The no load current is 2 A at 0.208 power factor lagging. Find the primary current and primary power factor.

(b) Draw the phasor diagram of a transformer on load when it is taking [8+8]

i. Resistive load

ii. Inductive load

iii. Capacitive load.

6. (a) How is the efficiency of the dc motor determined by the direct loading method? Derive the equation for efficiency.

(b) In a brake test on a dc shunt motor full load readings are as follows. Tension on tight side is 9.1 Kg, tension on slack side is 0.8 Kg. Total current is 10 A, supply voltage is 110V, speed is 132 rpm, effective radius of the pulley is 7.5 cm. Calculate its full load efficiency. [8+8]

7. (a) Derive the equation for torque of a three phase induction motor.

(b) A three phase slip ring induction motor gives a reading of 55 V across the slip rings on a open circuit, when at rest with normal stator voltage applied. the rotor is star connected and has an impedance of 0.7+j5 Ω/ph. Find the rotor current when the machine is

i. At standstill with slip rings joined to a star connected starter with phase impedance of 4+j3 Ω and

ii. Running normally with 5% slip. [6+10]

8. (a) Bring out the advantages and disadvantages of MI and MC instrument.

(b) Bring out the differences between various methods of producing controlling torque. [8+8]

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Code No: Z0521 / R07 **Set No. 4**

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

Answer any FIVE Questions
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1. Find the current through and the voltage across all the elements by using kirchoffs laws as shown in figure 1. [16]

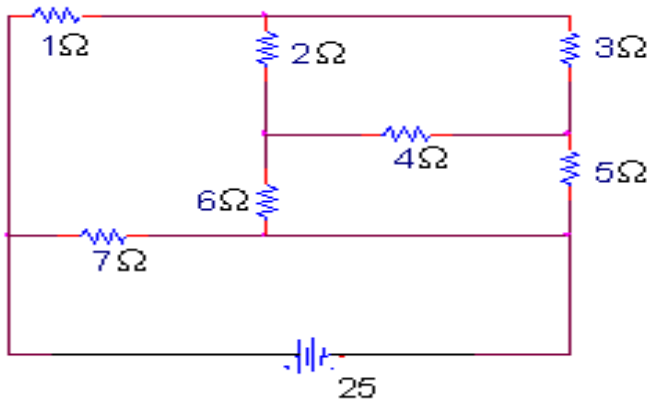

Figure 1

2. (a) Using star delta transformation find the current and power supplied by the battery as shown in figure 2a.

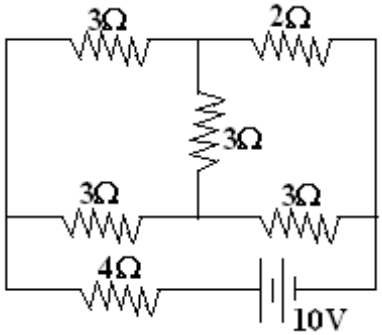

Figure 2a

(b) Describe in detail the steps to apply superposition theorem. [10+6]

3. (a) Prove K= $M/\sqrt{L_1}L_2$

(b) A primary coil having an inductance of 100 μH is connected in series with a secondary coil of 240 μH and the total inductance of the combination is measured as 146 μH. Determine the coefficient of coupling. [6+10]

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. (a) A double wound, single phase transformer is required to step down from 1900 V to 240 V, 50 Hz. It is to have 1.5V per turn. Calculate the required number of turns on the Primary and Secondary windings respectively. The peak value of flux density is required to be not more than 1.2 wb/sq.cm. Calculate the required cross-sectional area of the steel core. If the output is 10KVA, calculate secondary current.

(b) A 2200/200V, single phase transformer takes 1A at the high voltage side on no-load at a power factor of 0.385 lagging. Calculate the iron losses if a load of 50 A at a power of 0.8 lagging is taken from the secondary of the transformer. Calculate the actual primary current and its power factor. [8+8]

6. (a) Compare the operating characteristics of different types of DC motors.

(b) Draw the speed load characteristics curve of the DC shunt and series motor. Use these curves to explain the applications for which these motors are used. [8+8]

7. A 4-pole, 50 Hz, three phase, induction motor develops a maximum torque of 95 N-m at 1200 r.p.m. The resistance of the star-connected rotor is 0.5 Ω/phase. Caculate the value of resistance that must be inserted in series with each rotor phase to produce a starting torque equal to 3/4 the maximum torque. [5+5+6]

8. (a) Why is the scale of a MI instrument non uniform? Explain.

(b) With neat sketch, explain the process of eddy current damping. [8+8]

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