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NEW SCHEME

ELE15/25

USN

# First/Second Semester B.E. Degree Examination, July/August 2003

## Common to all branches

## (New Scheme)

# Basic Electrical Engineering

Time: 3 hrs.] [Max.Marks : 100

**Note:** *Answer any FIVE full questions.*

1. (a) State and explain Faraday's laws of electro magnetic induction, Lenz's Law. Fleming's right hand rule and Fleming's left hand rule. **(10 Marks)**

   (b) A coil of 300 turns wound on a core of non magnetic material has an inductance of 10mH. Calculate i) the flux produced by a current of 5A ii) the average value of the emf induced when a current of 5Amps is reversed in 8 milli seconds. **(5 Marks)**

   (c) With a neat sketch briefly explain how an alternating voltage is produced when a coil is rotated in a magnetic field. **(5 Marks)**

2. (a) Derive expressions for average value and RMS value of a sinusoidally varying AC voltage. **(6 Marks)**

   (b) A circuit having a resistance of $12\Omega$, an inductance of $0.15H$ and a capacitance of $100\mu f$ in series is connected across a 100V, 50Hz supply. Calculate the impedance, current, the phase difference between the current and supply voltage. **(6 Marks)**

   (c) Two circuits with impedances of $Z_1 = 10+j15\Omega$ and $Z_2 = 6-j8\Omega$ are connected in parallel. If the supply current is 20A, what is the power dissipated in each branch? **(8 Marks)**

3. (a) What are the advantages of a three phase system over a single phase system? **(4 Marks)**

   (b) With a neat circuit diagram and a vector diagram prove that two wattmeters are sufficient to measure total power in a 3 phase system. **(8 Marks)**

   (c) A balanced star connected load of $(8+j6)\Omega$ is connected to a 3 phase, 230V supply. Find the line current, power factor, power, reactive voltamperes and total voltamperes. **(8 Marks)**

4. (a) With a neat sketch explain the construction and working of a single phase induction type energymeter. **(8 Marks)**

   (b) With a neat circuit diagram and a switching table, explain the two point control of a lamp. **(6 Marks)**

   (c) With a neat sketch explain the pipe earthing method. **(6 Marks)**

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5. (a) Draw the cross sectional view of a d.c machine and explain the function of each part. (8 Marks)

(b) Derive an expression for the torque developed in a dc motor and show that the torque is proportional to the product of flux and armature current. (6 Marks)

(c) A 500V shunt motor has 4 poles and a wave connected winding with 492 conductors. The flux per pole is 0.05 wb. The full load current is 20 Amps. The armature and shunt field resistances are 0.1Ω and 250Ω respectively. Calculate the speed and the developed torque. (6 Marks)

6. (a) With neat sketches explain the constructional details of core type and shell type transformers. (8 Marks)

(b) Derive the emf equation of a transformer. (5 Marks)

(c) A 250 kVA, 11000/415V, 50Hz single phase transformer has 80 turns on the secondary. Calculate :

i) the rated primary and secondary currents

ii) the number of primary turns

iii) the maximum value of flux

iv) voltage induced per turn. (7 Marks)

7. (a) With a neat sketch explain the working of a 3 point starter for a DC motor. (7 Marks)

(b) With neat sketches explain the constructional details of an alternator. (7 Marks)

(c) A 3phase, 16 pole alternator has a star connected winding with 144 slots and 10 conductors per slot. The flux per pole is 0.03 Wb and the speed is 375 RPM.

Find the frequency, the phase emf and line emf. Assume pitch factor Kp = 1 and distribution factor $K_d = 0.96$. (8 Marks)

8. (a) Explain the principle of operation of a 3 phase induction motor. (5 Marks)

(b) A 3 phase induction motor has 6 poles and runs at 960 RPM on full load. It is supplied from an alternator having 4 poles and running at 1500 RPM. Calculate the full load slip and the frequency of the rotor currents of the induction motor. (7 Marks)

(c) Why are starters necessary for an induction motor? With a neat circuit diagram explain a star delta starter for a 3 phase induction motor. (8 Marks)

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