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P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; Dec. - 2019

Basic Electrical Engineering

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. State and explain Ohm's law. 4

b. Define coefficient of coupling and derive the expression for energy stored in an inductor. 8

c. State the following laws:

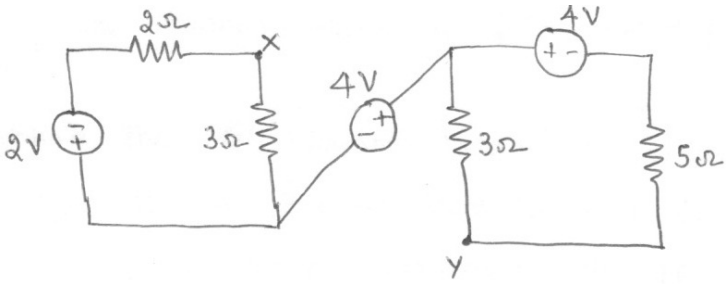
i) Faraday's laws of electromagnetic induction

ii) Fleming's left hand and Right hand rule 8

iii) Lenz's Law

2 a. State and explain Kirchhoff's laws applied to DC circuits. 6

b. Apply Kirchhoff's laws to find potential difference between *x* and *y* shown in the network.



8

c. The self-inductance of a coil having 500 turns is 0.25 Henry. If 60% if the flux is linked with a second coil of 10.000 turns. Calculate;

i) Mutual inductance of the two coil 6

ii) EMF induced in the second coil when current in the first coil changes at the rate of 100 A/s.

UNIT - II

3 a. Define the following:

i) RMS value ii) Average value 6

iii) Form factor iv) Peak factor

b. Show that the average power consumed by a pure capacitance is zero. 6

c. A series circuit with R = 10 Ω, L = 50 mH and C = 100 μF is supplied with 200 V, 50 Hz find

i) Impedance ii) Current iii) Power iv) Power factor 8

4 a. With the usual notations, prove that the power consumed in R-L circuit is $VI\cos\phi$. 6

b. Explain the term phase and phase difference applied to ac circuits. Distinguish between lagging power factor and leading power factor. 6

c. A circuit consists of branches A and B connected in parallel, is connected across a 220 V, 50 Hz supply; 8

Contd…2

Branch A: A resistance of 7 Ω in series with 0.0125 H inductor

Branch B: A resistance of 8 Ω in series with 1000 μF capacitor

Find the branch current and total currents. Draw phasor diagram.

UNIT - III

5 a. Establish the relationship between phase and line value of voltages and currents in 3-phase star connected circuit. Draw the phasor diagram and obtain the expression for power. 8

b. With a neat diagram, explain the construction and working principle of dynamometer type wattmeter. 6

c. With wiring diagram, explain two-way and three-way control of lamp. 6

6 a. With relevant diagrams show that two wattmeter are enough to measure three phase power. 6

b. What is the necessity of earthing? With neat figure explain plate earthing. 8

c. A balanced delta connected load (8 + j6) Ω per phase is supplied from a 3-phase 440 V source. Find the line current, power factor, power per phase and total power. 6

UNIT - IV

7 a. With neat figure, explain the constructional feature of DC machines. 8

b. Define torque. With usual notation derive the expression for the armature torque developed in DC motor. 8

c. Calculate the flux per pole required for 4-pole generator with 360 conductors generating 250 V at 1000 rpm, When the armature is, i) Lap connected ii) Wave connected. 4

8 a. What is back emf in DC motor? Illustrate its significance. 6

b. With usual notation, derive the emf equation of a synchronous generator. 6

c. A 12 pole 500 rpm star connected alternator has 60 slots with 20 conductors per slot. The flux per pole is 0.02 Weber and is distributed sinusoidally. The winding factor is 0.93, calculate; i) Frequency ii) Phase emf iii) Line emf. Assume coil is full pitched. 8

UNIT - V

9 a. Explain the concept of rotating magnetic field in induction motor. 8

b. Explain why induction motor needs a starter during starting? 6

c. What is slip in an induction motor? Find the slip and speed of a 4 pole induction motor with frequency of emf in the stator is 50 Hz and in the rotor is 1.5 Hz. 6

10 a. Derive the EMF equation of a transformer from fundamentals and obtain expression for transformation ratio. 6

b. The primary and secondary winding of a 500 kVA transformer have resistance of 0.5 Ω and 0.002 Ω respectively. The primary and secondary voltages are 10000 V and 400 V respectively and the core loss is 3 kW, the power factor on the load is 0.8, calculate the efficiency on i) Full load ii) Half full load 8

c. Explain various losses that occur in a transformer? How are they minimized 6

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