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

(An Autonomous Institution affiliated to VTU, Belagavi)

Second Semester, B.E. - Semester End Examination; May / June - 2019

Basic Electrical Engineering

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

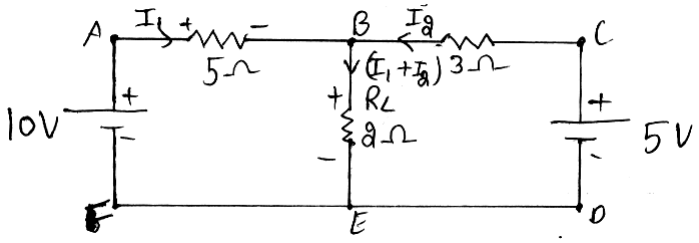
***Note**: Answer **FIVE** full questions, selecting **ONE** full question from each unit.*

UNIT - I

1 a. State and explain the Kirchhoff's law. 6

b. Derive an expression for Self induced *emf*. 6

c. Find the current through R_L for the network shown in below figure, 8



2 a. Define Self and Mutual induced *emf* and derive an expression for coefficient of coupling. 8

b. State and explain the Faraday's law of electromagnetic induction. 6

c. Two identical coils of 1200 turns each are placed side by side such that 60% of the flux produced by one coils links other. A current of 10 A in the first coil sets up a flux of 0.12 m Wb. If the current in the first coil changes from +10 to −10 A in 20 ms. Find; 6

i) The self-inductances of the coils ii) The *emf* 's induced in both the coils

UNIT - II

3 a. Define the following terms : 6

i) Real power ii) Reactive Power iii) Apparent power iv) Power factor

b. Derive an expression for the average power consumed in a series RC circuit. Draw the related waveform. 6

c. A coil having a resistance of 7 Ω is connected in series with an inductance of 31.8 mH to a source of 230 V, 50 Hz supply. Calculate; 8

i) The circuit current ii) Voltage across each element iii) Phase angle

iv) Power factor v) Power consumed vi) Phasor diagram

4 a. Define the following terms : 6

i) RMS value ii) Average value iii) Form factor iv) Peak Factor

b. Show that the current in pure capacitor leads the voltage by 90°. 6

c. A resistance of 20 Ω and inductance of 0.2 H and capacitance of 100 μf are connected in series across 220 V, 50 Hz supply. Calculate; i) Impedance ii) Current iii) Voltage across each element iv) Power absorbed v) Power factor 8

Contd…2

UNIT - III

5 a. Develop the relation between line and phase values for 3-ϕ balanced star connected system. 8

b. Three similar coils each having resistance of 20 Ω and an inductive reactance of 15 Ω are connected in delta to a 440 V three phase 50 Hz supply. Determine; 6

i) The line current ii) Power factor iii) Power supplied

c. Mention the preventive measure should be taken against electric shock, and list out the characteristics of Fuses. 6

6 a. What is the necessity of Earthing? With a neat sketch explain Plate earthing. 6

b. With a neat sketch, explain the construction and working of a single phase induction type energy meter. 7

c. With the help of a circuit diagram and switching table, explain 2-way and 3-way control of lamps. 7

UNIT - IV

7 a. With a neat sketch, explain the construction of a DC machine and function of each part. 8

b. Derive an expression for the torque developed by a DC motor. 6

c. An 8-pole DC has 500 armature conductors and a useful flux of 0.05 Wb per pole. What will be the *emf* generated, if it is lap-connected and runs at 1200 rpm? What must be the speed at which it is to be driven to produce the same *emf*, if it is wave-wound? 6

8 a. What is Back *emf*? Explain its significance. 6

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

c. Find the phase and line voltage of a star-connected 3-phase, 6-pole alternator which runs at 1200 rpm, having flux per pole of 0. 1 Wb sinusoidally distributed. Its stator has 54 slots having double layer winding. Each coil has 8 turns and the coil is chorded by 1 slot. 8

UNIT - V

9 a. Obtain an expression for *emf* of a transformer. 6

b. What is a transformer? Explain the construction of Core type and Shell type transformer. 8

c. In a 25 kVA, 2000/200 V, single phase transformer, the iron and full-load copper losses are 350 and 400 W respectively. Calculate the efficiency at unity power factor at, 6

i) Full load ii) Half full-load

10 a. Explain the concept of rotating magnetic field in a three phase induction motor. 8

b. Explain the concept of slip and its significance in a three phase induction motor. 6

c. A 10-pole induction motor is supplied by a 6-pole alternator which is driven at 1200 rpm. If the motor runs at a slip of 3%, what is the speed of the induction Motor? 6

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