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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; June – 2017

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. A circuit consists of two parallel resistors having resistance of 20 Ω and 30 Ω respectively, connected in series with 15 Ω resistor. If the current through 15 Ω resistor is 3 A. Find; (i) Current in 20 Ω and 30 Ω resistors (ii) The supply voltage across the whole circuit (iii) The total power and power consumed in each resistor. 8

b. With examples, clearly differentiate between dynamically induced emf and statically induced emf. 6

c. A coil of resistance 150 Ω is placed in a magnetic field of 0.1 mwb. The coil has 500 turns and a galvanometer of 450 Ω is connected in series with it. The coil is moved in 0.1 sec from the given field to another field of 0.3 mwb. Find the average induced emf and the average current through the coil. 6

2 a. State and illustrate Lenz's law. 6

b. Obtain the potential difference V_{xy} in the circuit of Fig. Q. 2b. 8

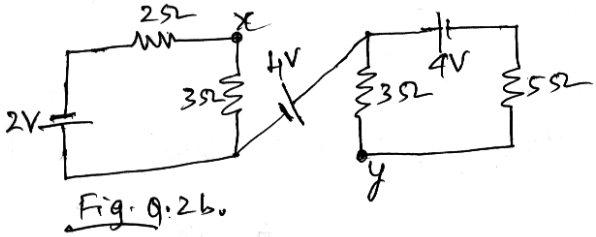

Fig. Q.2b.

c. Define the following terms giving their equations if any: (i) Self inductance (ii) Mutual inductance (iii) Ohm's law (iv) Kirchhoff's laws. 6

UNIT - II

3 a. Define RMS and Average value of a sinusoidal emf and obtain their expressions. 6

b. When 220 V AC supply is applied across AB terminal of the circuit shown in Fig.Q.3b. The total power input is 3.25 kW and current is 20 A. Find the current through Z_2 and elements of Z_2. 8

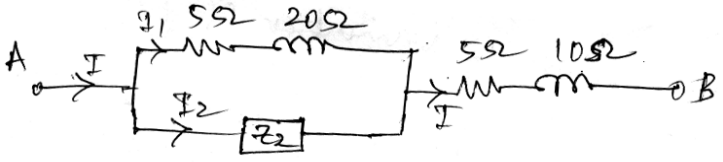

Fig. Q.3b.

c. For the current waveform shown in Fig. Q.3c. Find, (i) Peak current (ii) Average value (iii) Periodic time (iii) Frequency (v) Instantaneous value at t = 3 ms. 6

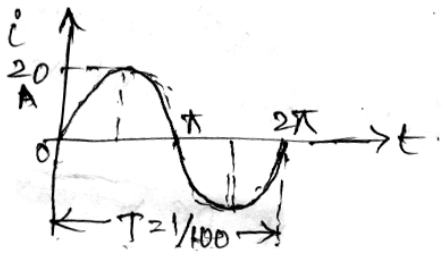

Fig. Q.3c

Contd....2

4 a. A series RLC circuit is connected across a 50 Hz supply, where R = 100 Ω, L = 159.16 mH and C = 63.7 μF. If the voltage across C is $150\angle -90V$, Find the supply voltage. 8

b. With reference to AC circuit, differentiate between,
(i) phase and phase difference (ii) lag and lead power factor 6
(iii) Reactance and impedance.

c. A current of average value 18.019 A is flowing in a circuit to which a voltage of peak value in a 141.42 V is applied. Determine;
(i) Impedance in Polar form (ii) Power 6
Assume voltage lags current by 30º.

UNIT - III

5 a. List out the advantages of 3-ϕ systems over single phase systems. 6

b. What is fuse? Define the following terms with respect to fuse:
(i) Rated carrying current (ii) Fusing current (iii) Fusing factor. 6

c. What is electric shock? Mention the factors on which electric shock depend. What are the precautionary measures to be taken against electric shock? 8

6. a Discuss the effect of variation of power factor on wattmeter reading. 6

b. Calculate the current flowing into each terminal and in each phase of the winding of a 3-ϕ, Δ connected induction motor developing an output of 250 HP at 2300 V, between the terminals at a power factor of 0.75 and efficiency of 85%. 8

c. What do you mean by earthling? Explain why electrical appliances must be earthed. 6

UNIT - IV

7 a. What are the various types of DC generators? Give their circuit representation and related equations. 8

b. The current drawn from the mains by a 220 V DC shunt motor is 4 A on no load. The resistances of the field and armature windings are 110 Ω and 0.2 Ω, respectively, if the line current on full load is 40 A at a speed of 1500 rpm. Find the no load speed. 6

c. Enumerate the advantages of having stationery armature and rotating magnetic field system in a large size alternator. 6

8 a. Define torque. With usual notation derive the expression for the armature torque developed in a DC motor. 6

b. A 4 pole, 1500 rpm Y-connected alternator has 9 slots/pole and 8 conductors/slot. Determine the flux/pole to give a terminal voltage of 3300 V. Take winding factor and pitch factor as unity. 6

c. A separately excited DC generator, when running at 1000 rpm supplies 50 A at 250 V. Find out how much current it will deliver when the speed falls to 800 rpm. Take armature resistance as 0.01 Ω and brush drop as 1 V/brush. 8

UNIT - V

9 a. Explain the principle of operation of a single phase transformer giving its no load vector diagram. 8

b. Explain the concept of rotating magnetic field in an induction motor. 6

c. Determine the efficiency of a 150 kVA transformer at 50% and 75% of full load at 0.8 power factor lag if the full load copper and iron losses are 1600 watts and 1400 watts, respectively 6

10 a. In a transformer the iron loss is constant loss and copper loss is the variable loss. Justify this? Explain how they are minimized. 8

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

c. A 6 pole IM is supplied by a 10 pole alternator which is driven at 600 rpm. If the motor is running at 970 rpm, determine the percentage slip. 6

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