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

(An Autonomous Institution affiliated to VTU, Belgaum)

First Semester, B.E. - Make-up Examination; Jan / Feb - 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. State and explain Ohm's law. Mention the limitations of it. 6

b. If the total power dissipated in the circuit shown in Fig. Q1b is 18 watts. Find the value of 'R' and the current through it. 6

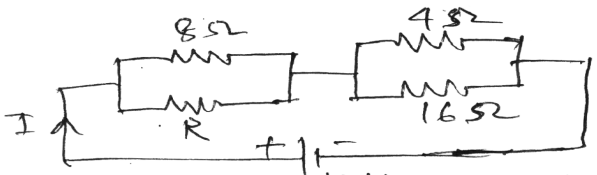

Fig. Q 1b.

c. What are the types of induced emfs? Explain them in brief. 8

2 a. Define the terms : 8

i) self inductance ii) Mutual inductance

iii) coefficient of coupling iv) Lenz's law.

b. Determine the magnitude and direction of the current in the 2 V battery in the circuit of Fig. Q2b. 6

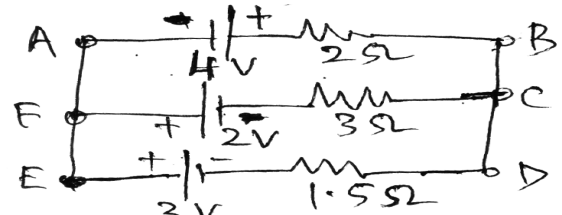

Fig. Q 2 b.

c. Two coils A and B having 4000 and 3000 turns respectively. When a current of 0.5 A flows in coil A produces a flux of 100 μwbs in it and 60% of the this flux links coil B. Find self inductance of coil A and mutual inductance between A and B. 6

UNIT - II

3 a. Derive an expression for RMS value of a sinusoidally varying alternating quantity. 6

b. An alternating current '*i*' is given by, $i = 141.4 \times \sin 314t$. Find; 6

i) The maximum value

ii) Time period

iii) Instantaneous value when *t* is 3 msec.

Contd.....2

c. A circuit consisting of branches A and B are connected in parallel, is connected a/s 220 V, 50 Hz, supply. Branch A containing a resistance of 7 Ω in series with 0.0125 H inductance and branch B contains a resistance of 852 in series with 1000 μF capacitor. Find the branch current and total current. Draw the phasor diagram. 8

4 a. Derive the expressions for current, power and power factor in an RL circuit. 8

b. A current, $i = \sin(31t - 10^o)$ produces a potential drop, $v = 220 \sin(31t + 20^o)$ in a circuit. Find the values of circuit parameters, assuming a series combination. 6

c. A series circuit with R = 10 Ω, L = 50 mH and C = 100 μF is supplied with 200 V, 50 Hz. Find; 6

i) Impedance ii) Current iii) Power iv) Power factor. Draw the phasor diagram.

UNIT - III

5 a. Obtain the relation between line and phase values of voltage and current in balanced star connected network. 8

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

c. A balanced 3-ϕ, *y*-connected load draws power from a 440 V supply. The two watt meters connected indicate $w_1 = 4.2$ kW and $w_2 = 0.8$ kW. Calculate the power, power factor and current in the circuit. 6

6 a. What is electric shock? What are the causes and precautions to be taken to prevent it? 6

b. What is earthing? With a neat sketch, explain plate earthing. 6

c. With a neat sketch, explain the construction and working of single phase energy meter. 8

UNIT - IV

7 a. Explain the principle of operation of a DC machine as : 6

i) A generator ii) A motor.

b. A 110 DC shunt generator delivers a load current of 50 A. The armature resistance is 0.2 Ω and the field circuit resistance is 55 Ω. The generator rotating at a speed of 1800 rpm has 6 poles, lap wound and has a total of 360 conductors. Calculate; 6

i) The no load voltage in the armature

ii) The flux/pole.

c. What are the various types of DC motors? Give their circuit representation and related equations. 8

8 a. With suitable notations, derive the EMF equation of synchronous generator. 6

b. With relevant sketches, distinguish between salient pole and non salient pole type synchronous generators and when these are preferred? 8

Contd.....3

c. A 12 pole, 500 rpm, star connected alternator has 60 slots with 20 conductors per slot. The flux per pole is 0.02 wbs and is distributed sinusoidally. The winding factor is 0.97. Calculate; 6

i) Frequency

ii) Phase emf

iii) Line emf. Assume the coil is full pitched.

UNIT - V

9 a. With the help of a neat sketch, explain the constructional features of single phase transformer. 8

b. With suitable background, obtain the expression for efficiency of single phase transformer. 6

c. In a 25 kVA, 2000/200 volts, 1-ϕ transformer, the iron and full load copper losses are 350 and 400 watts, respectively. Calculate the efficiency at unity power factor on : 6

i) Full load

ii) Half full load.

10 a. Enumerate the advantages and disadvantages of three phase induction motors. 8

b. What is slip in an induction motor? Explain why slip is never zero in an induction motor? 6

c. If the frequency of EMF in the stator of an 8 pole induction motor is 50 Hz and that in the rotor is 1.5 Hz. What is the value of slip and at what speed is the motor running? 6

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