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

(An Autonomous Institution affiliated to VTU, Belgaum)

Second Semester - B.E. - Semester End Examination; June – 2016

Basic Electrical Engineering

(Common to All Branches)

Time: 3 hrs *Max. Marks: 100*

***Note**: i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.*
ii) Missing data may suitably assume.

UNIT - I

1 a. Explain the following terms with necessary derivations :
(i) Statistically induced emf
(ii) Mutually induced emf — 8

b. In the circuit shown in Fig. Q.1(b) power dissipated in 10 Ω resistor is 40 W. Determine the value of R. — 8

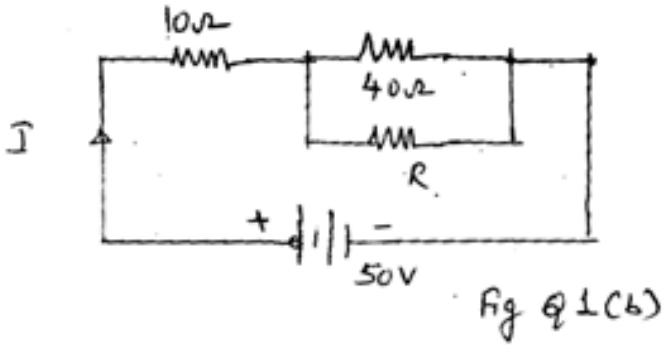

Fig Q 1(b)

c. A coil of 150 turns is linked with a flux of 0.01wb when carrying a current of 10 A, Calculate the inductance of the coil. If this current is uniformly reversed in 0.01 second, Calculate the induced emf. — 4

2 a. Derive an expression for the energy stored in a magnetic field. — 6

b. Two resistors are connected in parallel across 100 V DC supply current drawn by the circuit is 10 A and the power dissipated in one resistor is 600 W. What is the current drawn by the resistors when they are connected in series across the same supply? — 8

c. The self inductance of a coil having 500 turns is 0.25 H. If 60% of the flux is linked with a second coil of 10,000 turns calculate;
(i) Mutual inductance of the two coils,
(ii) E.M.F. induced in the second coil when current in the first coil changes at the rate of 100 A/sec. — 6

Contd….2

UNIT - II

3 a. Distinguish between lagging power factor and leading power factor in a.c. circuits. Show that current in a R-C circuit leads the voltage by an angleϕ. Draw necessary circuit diagram, vector diagram and waveforms. 8

b. A voltage of 100 V at 50 Hz is applied to a R-L series circuit. The current in the circuit is 5 A lagging behind the voltage by 35º. Write the expression for the current and voltage. Find the values of R and L. 8

c. An alternating emf is mathematically expressed as $e = 200 \sin 314t$. Find ;

(i) The amplitude (ii) Frequency (iii) The instantaneous value, when $t = 1/200$ sec. 4

4 a. Define Average value and RMS value of a sinusoidal alternating current. Derive an expression for RMS value of a sinusoidal waveform. 6

b. What is meant by phase angle between two alternating of quantities? Show that the average power in an ac circuit is given by $P = VI \cos\phi$. 6

c. A voltage $v = 100 \sin 314t$ is applied to a circuit consisting of a 25 Ω resistor and an 80 microfarad capacitor in series. Determine ;

(i) An expression for the value of current

(ii) The power consumed by the circuit. 8

UNIT - III

5 a. Establish the relation between phase and line values of voltages and currents in 3 phase star connected circuit. Draw the phasor diagram. 6

b. Three equal impedances each having a resistance of 8 Ω and inductance reactance of 6 Ω are connected in star across a 3 phase 440 V system. Find;

(i) Phase current

(ii) Line current

(iii) Total power consumed. 6

c. With the help of a neat diagram, describe the constructional features and working of a Dynamometer wattmeter. 8

6 a. Mention the advantages of 3 phase system over single phase system. 6

b. A balanced star connected load is supplied from a balanced 3 phase 400 V, 50 Hz system. The current in each phase is 30 A and lags 30º behind the phase voltage. Draw the phasor diagram. 6

c. What do you mean by earthing? Explain why installations must be earthed. With a neat diagram explain plate earthing. 8

Contd….3

UNIT - IV

7	a.	With usual notations derive an expression for the induced EMF of a DC machine.	6
	b.	4 pole 250 V series motor has a wave connected armature with 1254 conductors. The flux per pole is 22 mwb when the motor is taking 50 A. Armature resistance is 0.2 Ω. Calculate the speed.	4
	c.	With neat diagrams explain different types of rotors used in synchronous generators where are the two types used.	10
8	a.	List different types of DC motors. Write the circuit representation of each type and explain.	8
	b.	A 250 V shunt motor takes a total current of 20 A. Resistance of the shunt field is 200 Ω and of the armature 0.3 Ω. Find the current in the armature and back emf.	4
	c.	Starting from basic principles, develop an expression for the emf induced in an alternator.	8

UNIT - V

9	a.	Explain with a neat sketch construction of a shell type transformer.	4
	b.	Explain the principle of operation of a transformer.	4
	c.	In a 25 kVA 2000/200 V transformer, the iron and Copper losses are 350 W and 400 W respectively. Calculate the efficiency at UPF at half full load.	6
	d.	Briefly explain the construction and principle of operation of a 3 phase squirrel cage induction motor.	6
10	a.	Explain briefly various losses that occur in a transformer.	4
	b.	Derive the EMF equation of a transformer from fundamentals.	6
	c.	Explain the principle of operation of Induction motor. Why does it require a starter? Can it be run at synchronous speed? Why?	6
	d.	If the electromotive force in the stator of an 8 pole Induction motor has a frequency of 50 Hz and that in the rotor 1.5 Hz, at what speed is the motor running and what is the slip?	4

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