U.S.N

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-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. What must be values of R_1 and R_2 have in Fig. 1 (a).
(i) when $I_1 = 4$ A and $I_2 = 6$ A both are charging
(ii) when $I_1 = 2$ A discharging and $I_2 = 20$ A charging
(iii) under what condition $I_1 = 0$ 8

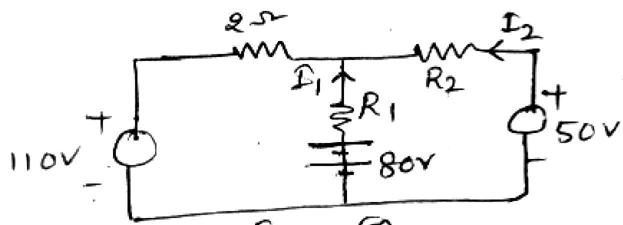

Fig 1 (a)

b. Define mutual inductance and obtain an expression for the same. 6

c. An air cored electromagnet has a length of 100 cm and a diameter of 4 cm. Calculate the inductance, if the coil has 2000 turns and also calculate the energy stored when the current rises from 0 to 10 A. 6

2 a. Find out the current distribution for the network shown in Fig. 2(a). 8

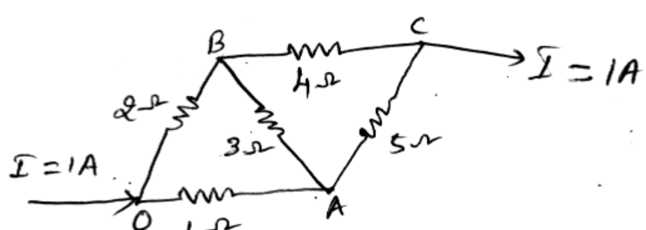

Fig 2 (a)

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

c. Define self inductance and obtain an expression for the same. 6

UNIT - II

3 a. Define RMS, average form factor and peak factor of an alternating quantity. 6

b. Show that the average power demand in case of pure resistance never becomes zero starting from basic fundamentals. 8

Contd…..2

	c.	In a series RLC circuit, a resistance of R Ω, an inductance of 0.2 H and a capacitance of C are connected in series, when an alternating voltage $v = 400\sqrt{2}Sin(314t - 20^{o})$ is applied to it. The current flowing in this circuit is $i = 10\sqrt{2}Sin(314t - 65^{o})$. Find the values of R and C.	6
4	a.	With relevant equations and phasor diagram/waveforms explain phase and phase differences.	6
	b.	Show that the average power demand in case of pure capacitance is always zero.	8
	c.	Two parallel impedances $Z_1 = (10 + j15)\ \Omega\ and\ Z_2 = (6 - j8)\ \Omega$ is connected in series with the third impedance $Z_3 = (5 + j2)\ \Omega$. Find out the branch current and the power consumer in each branch, when the circuit takes a current of 15 A.	6

UNIT - III

5	a.	With the help of phasor diagram, derive an expression for line voltage and line current for a star connected balance load.	6
	b.	Two watt meters are used to measure the power in 3φ balanced system. What is the power factor when (i) Both wattmeter reads equal values (ii) Both reads equal but of opposite values (iii) one reads twice the other (iv) one of the wattmeter reads zero?	6
	c.	With neat diagram, explain the principle of working of a dynamometer type wattmeter.	8
6	a.	With the help of phasar diagram, derive an expression for line voltage and line current for a delta connected balanced load.	6
	b.	A balanced 3 ϕ star connected load has an impedance of (5-j8) Ω per phase connected to a supply voltage of 500 V. Calculate (i) line current (ii) power factor and (iii) Power consumed.	6
	c.	With neat diagram, explain the construction of an induction type energy meter.	8

UNIT - IV

7	a.	Explain the constructional details of various types of Synchronous generator.	8
	b.	Define torque and obtain an expression for the same.	6
	c.	A 4 pole DC shunt motor takes 22.5 A from a 250 V supply. The armature resistance is 0.5 Ω and shunt field resistance is 125 Ω. The armature is wave wound with 300 conductors. If the flux/pole is 0.02 wb. Calculate; (i) Speed (ii) Torque developed and (ii) Power developed.	6
8	a.	What do you mean by Back EMF? What are its significances?	6
	b.	Explain the various characteristics of DC shunt motor.	6
	c.	A 3ϕ, 8 pole alternator is star connected. The stator has 160 slots with 6 conductor/slot with a full pitched distributed winding. If the rotor speed is 750rpm, Estimate the flux required in the air gap to generate an emf of 1000 V between lines. Assume a distribution factor of 0.85.	8

UNIT - V

9 a. With usual notations, derive an EMF equation of a transformer. 6

b. With neat diagram, explain the constructional details of various types of Induction motors. 8

c. A 600 kVA single phase transformer has an efficiency of 92% both at full load and half load at U.P.F. Determine its efficiency at 75% full load at 0.9 p.f. lag. 6

10 a. Mention the various types of losses in a transformer. How are they minimized? 5

b. A 125 kVA transformer has a primary voltage of 2000V at 60 Hz. Primary turns are 182 and secondary turns are 40. Neglect losses and calculate: 5

(i) No load secondary emf

(ii) Full load primary and secondary currents

(iii) Flux in the core.

c. What do you mean by slip? Derive an expression for the rotor frequency. 5

d. A 3ϕ Induction motor has 4 poles and it is supplied from a 50 Hz source. If the full load speed is 1470 rpm. Determine: (i) Slip speed (ii) Fractional slip (iii) Percentage slip. 5

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