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

***(An Autonomous Institution affiliated to VTU, Belgaum)***

**First Semester, B.E. – Semester End Examination; Dec. - 2015**

**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 Kirchoff's laws applied to D.C. circuits. 6

b. In the network shown in Fig. 1(b) the current is the 12 Ω resistor is 2.5. A Determine the battery voltage E and the power dissipated in 6 Ωresistors. 8

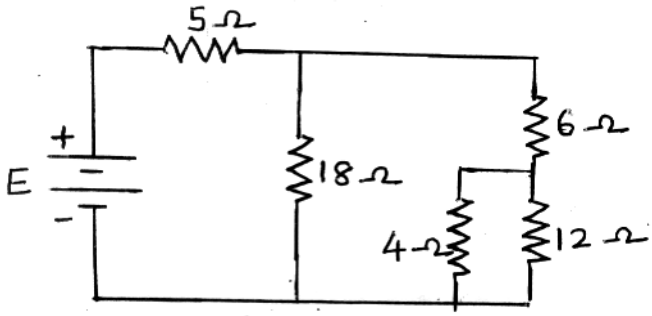

Figure 1(b)

c. Define coefficient of coupling and derive the expression for energy stored in an inductor. 6

2 a. State and explain: 6

(i) Fleming's left hand rule (ii) Fleming's right hand rule

b. The coefficient of coupling between two coils is 0.75, when a current of 3 A flows in the first coil having 250 turns, the total flux produced in this coil is 4 mwb. When this current is linearly changed from 3 A to zero in 3 milli seconds, the voltage induced in the second coil is 70 V. Determine $L_1$, $L_2$, M and $N_2$. 8

c. For the network shown in Fig. 2(c) find the currents in all branches. 6

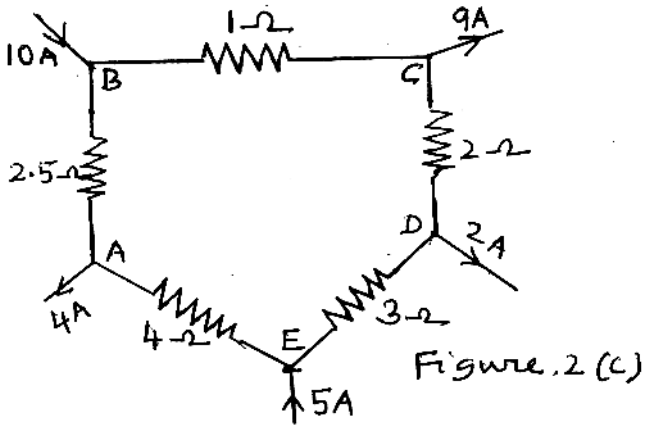

Figure.2 (c)

Contd…..2

**UNIT - II**

3 a. Define Average value, RMS value and form factor in an alternating circuit. 6

b. A current of 0.9 A flows through a series combination of resistor 120 Ω and a capacitor of reactance 250 Ω. Find the impedance, power factor, supply voltage, voltage across resistor, voltage across capacitor, apparent power, active power and reactive power. 8

c. Prove that the current in a purely inductive circuit lags behind the applied voltage by 90º. 6

4 a. Starting from fundamentals, show that the power consumed in a single phase A.C. circuit is given by VI cosϕ. 6

b. Two circuits A and B are connected in parallel across 200 V, 50 Hz supply. Circuit A consists of 10 Ω resistance and 0.12 H inductance in series while circuit B consists of 20 Ω resistances and 40 μF capacitance. Calculate;
(i) The current in each branch
(ii) The supply current
(iii) Total power factor. Draw the phasor diagram. 8

c. An impedance coil is parallel with a 100 μF capacitor is connected across a 200 V, 50 Hz supply. The coil takes a current of 4 A and the power in the coil is 600 watts. Calculate;
(i) The resistance of the coil
(ii) The inductance of the coil
(iii) the power factor of the entire circuit. 6

**UNIT - III**

5 a. Obtain the relationship between the phase and the line values of voltages and currents in a balanced 3 phase DELTA connected system. 6

b. With a neat diagram, explain the construction and working principle of dynamometer type wattmeter. 8

c. A balanced 3 phase, star connected 210 kW load takes a leading current of 160 A when connected across a balanced three phase 1.1kV, 50 Hz supply. Find the load circuit parameters per phase. 6

6 a. Explain pipe earthing with a neat diagram. 6

b. A balanced 3 phased star connected load draws power from a 440 V supply. The two wattmeters connected indicate $W_1$ = 5 kW and $W_2$ = 1.2 kW. Calculate the power, power factor and current in the circuit. 8

c. With a neat connection diagram and switching table explain the 3 way control of a lamp. 6

**UNIT - IV**

7 a. With a neat sketch, explain the constructional features of a D.C. machine. Mention the functions of each part. 10

Contd…..3

b. An eight pole, dc shunt generator has 778 wave connected conductors on its armature. While running at 800 rpm, it supplies power to a load of 12.5 Ω at 250 V. The armature and shunt field resistances are 0.24 Ω and 250 Ω respectively. Determine the armature current, the emf induced and the Flux per pole. 6

c. Enumerate any four advantages of having stationary armature and rotating field system in large size alternators. 4

8 a. With usual notations, derive the emf equation of a synchronous generator. 6

b. A 6 pole, dc shunt motor has a Lap connected armature with 492 conductors. The resistance of the armature is 0.2 Ω and the flux per pole is 50 mwb. The motor runs at 20 revolutions per second when it is connected to a 500 V supply for a particular load. What will be the speed of the motor when the load is reduced by 50%? Neglect contact drop and magnetic saturation. 8

c. A 2 pole, 3 phase alternator running at 3000 rpm has 42 slots with 2 conduction per slot. The flux per pole required to generate Line voltage of 2300 V. Assume $K_d = 0.952$ and $K_p = 0.956$. 6

**UNIT - V**

9 a. Explain the various losses that occur in a transformer. How are they minimized? 6

b. The efficiency at full load and unity power factor of a single phase 25 kVA, 500 V/1000 V, 50 Hz transformer is 98%. Determine its efficiency at 8

(i) 75% load, 0.9 p.f. (ii) 50% load, 0.8 p.f.

c. Explain the principle of operation of a 3 phase induction motor and give reason for "An induction motor can not run at synchronous speed". 6

10 a. The primary of a transformer is connected to a 240 V, 50 Hz supply. The secondary winding has 1500 turns. If the maximum value of the core flux is 0.00207 wb determine; 6

(i) The secondary induced emf

(ii) The number of turns in the primary

(iii) The cross sectional area of the core, if the flux density has maximum value of 0.465 $wb/m^2$.

b. A 12 pole, 3 phase alternator is coupled to an engine running at 500 rpm. It supplies an induction motor which has full load speed of 1440 r.p.m. Find the percentage slip and the number of poles of the motor. 6

c. Explain why an induction motor needs a starter. 4

d. What are the applications of 3 phase induction motors? 4

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