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

(An Autonomous Institution affiliated to VTU, Belagavi)

First Semester, B.E. - Semester End Examination; Dec - 2017/Jan - 2018

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.*

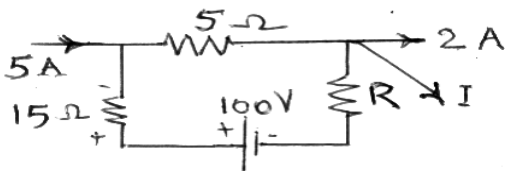
UNIT - I

1 a. State and explain KCL and KVL as applied to DC circuits. Give the sign conventions used, and illustrate the same through a sample circuit example. 8

b. Two identical coils of 1200 turns each are placed side by side such that 60% of flux of one coil links the other. A 10 A current in first coil sets flux of 0.12 mWbr. If the current in that coil changes from (+10A) to (-10A) in 20 ms. Find; 6

i) Self inductance (ii) Self emf induced for both coils.

c. A portion of a network has a configuration as shown in Fig Q. 1(c). The voltage drop across 15 Ω is 30 V. Find the values of *R* and *I*. 6

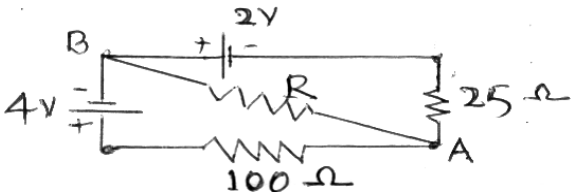


2 a. Define clearly the following : 12

i) Faraday's Laws ii) Lenz's law

iii) Fleming's rule iv) Statistically and Dynamically induced emf.

b. For the network shown in Fig. Q 2(b) determine the direction and magnitude of current flow in the resistor '*R*' of 10 Ω. 8



UNIT - II

3 a. Show that the voltage across a pure inductor and the current through it are displaced by 90º. Hence prove that the average power in a pure inductive circuit is zero. Draw the necessary wave shapes of current, voltage and power signals involved. 8

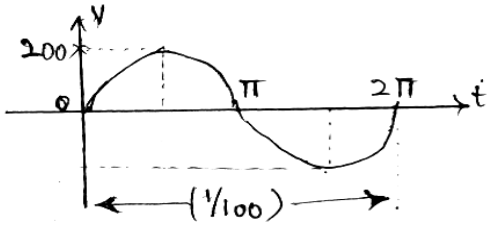
b. The series circuit of *R* = 8 Ω, L = 20 mH, has an applied voltage, $v(t)=283\sin(300t+90^o)$ V. Find the current drawn by the circuit. 6

c. Define RMS value of an AC quantity. Derive an expression for the same in terms of the maximum value. 6

4 a. For the waveform shown in Fig. Q 4 (a). Find; 8

i) Peak voltage ii) Frequency

iii) periodic Time iv) Instantaneous values at *t* = 2 ms, 6 ms and 10 ms.



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b. Define: i) Form Factor and peak factor and find their values for a sinusoidally varying current. ii) Power factor and give its value for a Pure-R, Pure-L and Pure-C circuit. 6

c. A resistor '*R*' is connected in series with the capadcitor '*C*' to a 50 Hz, 240 V supply. Find the values of *R* and *C*, so that '*R*' absorbs 300 W at 100 V. 6

UNIT - III

5 a. Obtain the relations for line voltages and line currents for delta connected load. Draw the phasor diagram. Also state the corresponding relations for the star connected load. 8

b. Three coils each of $R = 8\ \Omega$ and $X_L = 6\ \Omega$ are connected in star across a 400 V, 3 phase supply. Calculate the line current and the power absorbed. 6

c. Discuss on the need for and advantages of three phase AC systems. 6

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

b. Write a note on : i) Need for earthing ii) Electric shock and precautions needed to protect against the same. 6

c. The power input to a 3-phase circuit was measured by two watt meters and readings are: (3400 W) and (-1200 W) respectively. Calculate the total power and PF of load. 6

UNIT - IV

7 a. Draw the cross sectional view of DC machine and explain the function of each part. 8

b. Derive an equation for the torque developed in a DC motor and ST the torque is proportional to the product of armature current and flux. 6

c. A 500 V shunt motor has 4 poles and wave wound armature, with 492 conductors. Flux per pole is 50 mWbr, FL current is 20 A and $R_a = 0.1\ \Omega$, $R_f = 250\ \Omega$; Calculate the speed and torque developed. 6

8 a. With a neat sketch, explain the constructional details of a synchronous generator. 8

b. Write briefly on : i) Necessity of a starter in DC motors ii) Applications of DC motor. 6

c. A 3-phase, 16 pole alternator has Y-connected winding with 144 slots and 10 conductors per slot. Flux per pole is 30 mWbr and speed is = 375 RPM. Find the frequency, the phase and line emf. Assume pitch factor $k_p = 0.1$ and distribution factor $k_d = 0.96$. 6

UNIT - V

9 a. What are the main parts of transformer? What is the function and the main material of construction in each case? 6

b. With respect ot a transformer, give reasons for the following :
i) This is a small primary current even when on no load
ii) The corelosses are constant for any load.
iii) There is an inrush of current is primary circuit when the secondary is loaded. 6

c. Define power efficiency and regulation of a transformer. The maximum efficiency at FL and upf of a single phase, 25 kVA, 500/1000 V, 50 Hz, transformer is 98%. Determine the efficiency at : i) 75% load, 0.9 pf ii) 50% load, 0.8 pF. 8

10 a. Define Synchronous speed, slip speed and motor speed of a 3-phase induction motor. Explain why the induction motor cannot run at a synchronous speed? 6

b. Why is a startor needed for starting a 3-phase induction motor? 4

c. Discuss on the application of squirrel cage and slipring induction motors. 4

d. A 3-phase, 5 HP, 400 V, 50 Hz, induction motor is working at full load with 90% efficiency at a pF of 0.866 lag. Determine the power input and line current (Take 1 HP equal to 746 W). 6

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