[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2063)

923

B.Tech 2nd Semester Examination

(10) Basic Electrical Engineering (O.S.)

EE-1001

Time : 3 Hours **Max. Marks : 100**

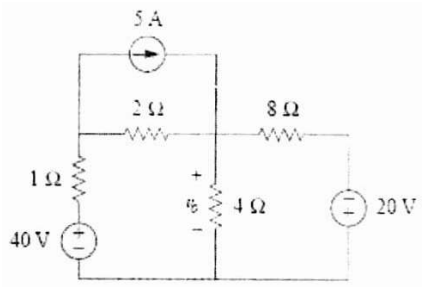
The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/ continuation sheet will be issued.

Note : Attempt five question in all, selecting one question each from section A. B, C & D. Section-E is compulsory.

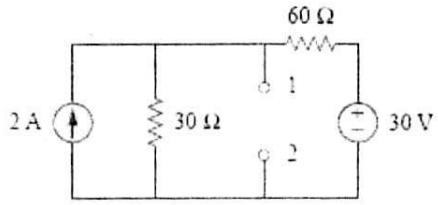
SECTION - A

1. (a) State and Explain KVL. **(3)**

(b) Using nodal analysis, find v_0 in the circuit shown in figure below. **(9)**



(c) Determine R_{th} and V_{th} at terminals 1-2 of the circuits in shown figure below **(8)**



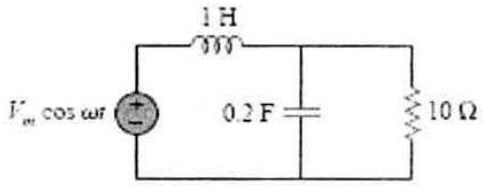
2. (a) A full wave rectified wave is clipped at $1/\sqrt{2}$ of its maximum value. Calculate the average and the RMS values of such voltage. **(8)**

(b) Define the term inductive reactance of a coil and explain its variation with frequency. Derive an expression for the instantaneous current drawn by an inductive circuit on application of sinusoidal alternating voltage. **(8)**

(c) Derive the expression for step response of series RC circuit. Define time constant. **(5)**

SECTION - B

3. (a) Calculate the resonant frequency of the circuit in figure below **(4)**



(b) A ratio of readings of two wattmeters connected to measure power in a balanced three – phase wire load is 5:3. The load is known to be inductive with a lagging power factor. Calculate the power factor of the load. **(8)**

(c) A balanced delta connected load is supplied by a 60- Hz three -phase source with line voltage of 240 V. Each load phase draws 6 kW at a lagging power factor of 0.8. Find

i. the load impedance per phase

ii. the line current

iii. the value of capacitance needed to be connected in parallel with each phase to minimize the current from the source. **(8)**

4. (a) A balanced star connected load with phase impedance 7.9+j5.7Ω at 50 Hz is supplied from a 400 V, 50 Hz balanced star connected source through connection impedance at 0.1+j0.3Ω in each line. Find (i) the line current and load voltage and (ii) the active and reactive power delivered by the source and delivered to the load. **(7)**

(b) A coil of resistance 40 Ω. and inductance 0.75 H forms part of a series circuit for which resonant frequency is 55 Hz. If the supply is 250 V, 50 Hz find (a) the line current (b) the power factor and (c) voltage across the coil. **(7)**

(c) An inductor L, a capacitor C and a resistor R connected in series. If $F = \frac{\omega}{\omega_0} - \frac{\omega_0}{\omega}$ and $n = \frac{R}{\omega_0 L}$ where ω is radial frequency and $\omega_0^2 = \frac{1}{LC}$ find (a) an expression for the impedance of the combination in terms of F, n and R. If F_m is the value of F when the magnitude of impedance has risen to 1.414 times the minimum value, find (b) the relationship between F_m and n (c) Express the magnitude of the impedance in terms of F, F_m and R. **(6)**

SECTION - C

5. (a) Explain three types of characteristics of a d.c. generator. Draw the external characteristics of various types of d.c. generators in the same figure. Why does the external characteristic of a shunt generator turn back as generator is overloaded? **(10)**

(b) A 50 kVA , 50 Hz, single phase transformer has an iron loss of 350 W and full load copper loss of 630 W. Find : (i) the load at which maximum efficiency occurs and the value of maximum efficiency at unity power factor, and (ii) the new core loss and full load copper loss, when maximum efficiency occurs at 85% of full load. Assuming that total full load loss is constant. **(10)**

6. (a) Explain with the help of diagrams, how a rotating magnetic field is produced in the air-gap of a 3-phase induction motor. **(7)**

(b) Derive an equivalent circuit for a single phase transformer. Define equivalent resistance and equivalent reactance. **(7)**

(c) In the case of an 8-pole induction motor, the supply frequency was 50 Hz and the shaft speed was 735 rpm. What were the magnitudes of the following:-

(i) Synchronous speed (ii) Speed of slip (iii) Per unit slip (iv) percentage slip **(6)**

[P.T.O.]

SECTION - D

7. (a) Discuss the working and constructional details of Electrodynamometer type wattmeter. **(8)**

   (b) A moving coil milliammeter has a resistance of 5Ω and a full scale deflection of 20 mA. Determine the resistance of a shunt to be used so that the instrument could measure currents upto 500 mA at 20°C. What is the percentage of error in the instrument operating at a temperature of 40°C? Temperature coefficient of copper=0.0039 per °C. **(8)**

   (c) Discuss the various ratings of a battery? **(4)**

8. (a) Compare PMMC and moving iron instruments on the basis of their operating principle. List their respective advantages also. **(7)**

   (b) State the Faradays laws of electrolysis. Discuss any one electrochemical cell in detail. **(7)**

   (c) Differentiate between absolute and secondary instruments. Discuss various components of indicating instruments. **(6)**

SECTION - E

9. (a) Define Voltage regulation of a transformer.

   (b) Explain why the emf generated in the armature of d.c. motor is called 'back emf'.

   (c) Why are root mean square values of alternating quantities more important than their average values?

   (d) Explain the term power factor in connection with ac circuits.

   (e) Can a 60 Hz transformer be operated on a 50 Hz system? What actions are necessary to enable this operation?

   (f) Define ampere-hour efficiency of battery.

   (g) Why is starter needed to start a DC motor?

   (h) Why is salient pole construction not used for rotor of high speed alternators?

   (i) State Compensation theorem.

   (j) Which types of meters are recommended for measurement of current and voltage in ac circuits?

(10×2=20)