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B.TECH
BENG 1102

2ND SEMESTER EXAMINATION, APRIL – 2005

BASIC ELECTRICAL ENGINEERING

Full Marks – 70

Time – 3 Hours

The figures in the right hand margin indicate full marks for the questions.

Answer Question No. 1 which is compulsory and any five from the rest.

1. Answer the following questions briefly : 2×10
- Three nos. of 6 ohm resistors are connected in Delta. What is its star equivalent ?
 - A D.C. voltage V is switched on to a series R-L circuit. Write the differential equation for the circuit. Find the expression for instantaneous current.

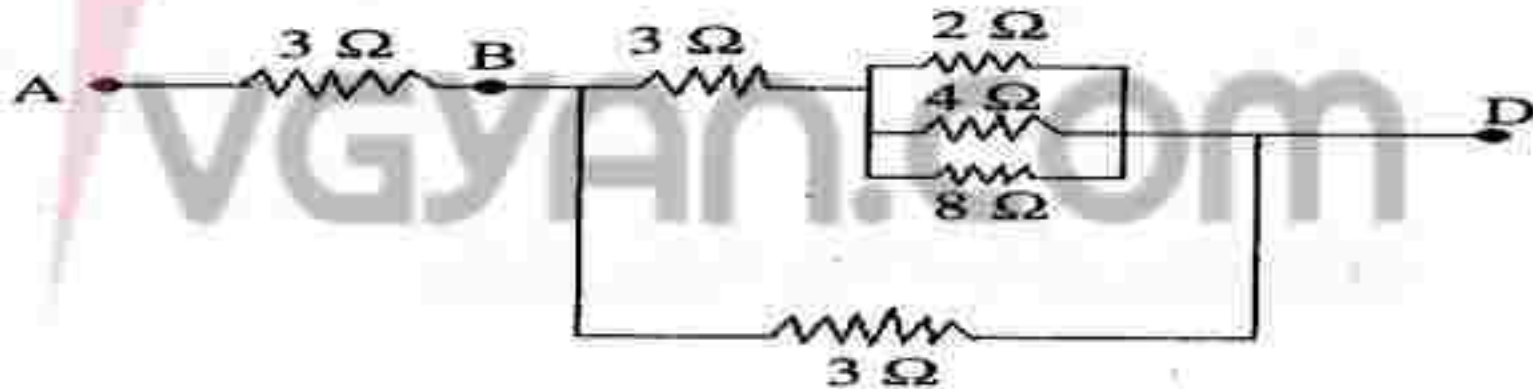
P.T.O.

- (iii) State the superposition theorem. Does the equation $y = mx + c$ follow the principle of superposition when x and y are input and output voltages and m & c are constants ?
- (iv) What is the constructional difference between wattmeter and energymeter ?
- (v) An A.C emf is given by $e = 200 \sin(628t + \pi/4)$. What is its rms value, frequency and phase angle ?
- (vi) A circuit has current $I = (4 + j3)$ Amp. and voltage $V = (6 + j8)$ Volts. Give the complex form of power.
- (vii) On a closed iron core a winding A B C is wound. AB = 100 turns, BC = 50 turns. An a.c. voltage of 200 V is applied across AB. What is the voltage across AC ?
- (viii) A D.C. shunt motor runs at 1000 rpm. When an additional resistance is connected in

series with the field winding, its speed will be equal to or more than or less than 1000 rpm ? Give reason.

- (ix) A moving iron instrument deflects by $\pi/4$ radian for a current of 5 A. What will be deflection for a current of 10A.
- (x) Name the different sections of power system by which the electric power reaches your home from the generating station.

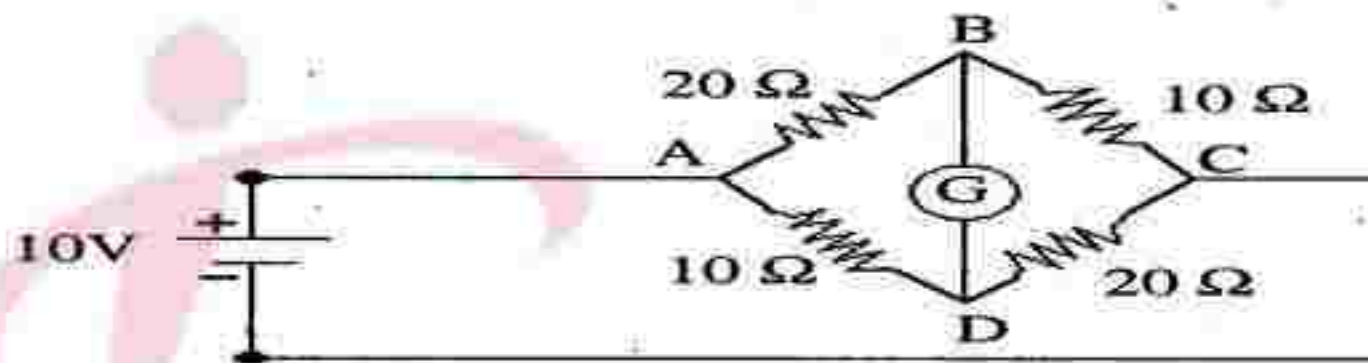
2.
(a)



Current flowing through branch AB is 10A.
Find the currents through the resistors of 2 Ω,
4 Ω & 8 Ω.

5

- (b) The arms of a wheatstone bridge has the following resistance values : $AB = 20 \Omega$, $BC = 10 \Omega$, $AD = 10 \Omega$, $CD = 20 \Omega$, Resistance of Galvanometer $G = 10 \Omega$. A battery of $10V$ is connected across AC . Find the potential difference between B & D . 5



3. (a)



Determine the current in the 5Ω resistance by application of Thevenin's theorem. 5

(b) A resistance of 1000Ω and a capacitor of $100 \mu\text{F}$ are connected in series to a 100 volts DC. Find initial current, final current and current after 0.2 second. 5

4

(a) A circuit contains an inductance of 1 H in series with a resistance of 100Ω . A voltage of $e = 100\sqrt{2} \sin 314 t$ is applied across the circuit. Express the r.m.s. value of current in polar form, complex form. Give the expression for instantaneous current under steady state. 6

(b) An R.L.C. series circuit is resonant at a frequency of 100 Hz. The value of the capacitor is changed so that the circuit resonates at a frequency of 200 Hz. Find the percentage changes in the capacitor values & the current at resonance the applied voltage remaining same. 4

5.

- (a) Three impedances of each $(8 + j6) \Omega$ are connected in star and to a 200 V 50 Hz 3 phase supply. What is the total power consumed? What will be the change in power consumed if the same impedances are connected in Delta?
- (b) 2 impedances of values $(4 + j3) \Omega$ and $(4 - j3) \Omega$ are connected in parallel. Find the impedance and power factor of the parallel circuit.

5

6.

- (a) A magnetic core has a length of 50 c.m. and cross-sectional area of 16 sq cm. Relative permeability of core material is 1000. If applied mmf is 1000 Amp turns what is the flux? By what % the flux will reduce if a saw cut of 1 mm long is made in the core section?
- (b) The primary of a single phase transformer is connected to a 222 V 50 Hz supply. If the peak flux in the core is 10 mwb, what is the

6

no. of turns in the primary ? How many number of turns are required in the secondary to obtain a voltage of 110V. 4

7 ✓ (a) State the laws which are used to generate voltage in D.C. generator. In a 4 pole D.C. generator the flux per pole is 6 mwb there are 96 conductors and they are wave-connected. What is the induced voltage if the armature rotates at a speed of 1500 revolutions/minute. 5

(b) Explain the working principle of a 3 phase induction motor. What is the amount of torque developed by the motor at synchronous speed ? 5

8 ✓ (a) In a D.C. PMMC instrument the moving coil has 10 turns of negligible resistance and is suspended in a field of 0.1 wb/sqm. The area of the coil is 10 sq. cm. A resistance of 10000 Ω is connected in series with the coil and the

no. of turns in the primary ? How many number of turns are required in the secondary to obtain a voltage of 110V. 4

7 ✓ (a) State the laws which are used to generate voltage in D.C. generator. In a 4 pole D.C. generator the flux per pole is 6 mwb there are 96 conductors and they are wave-connected. What is the induced voltage if the armature rotates at a speed of 1500 revolutions/minute. 5

(b) Explain the working principle of a 3 phase induction motor. What is the amount of torque developed by the motor at synchronous speed ? 5

8 ✓ (a) In a D.C. PMMC instrument the moving coil has 10 turns of negligible resistance and is suspended in a field of 0.1 wb/sqm. The area of the coil is 10 sq. cm. A resistance of 10000 Ω is connected in series with the coil and the