

17005(M)

B. Tech 2nd Semester Examination
Principles of Electrical Engineering (CBS)

EE-101

Time : 3 Hours

Max. Marks : 60

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

SECTION - A

1. (a) Use mesh analysis to find i_1 , i_2 and i_3 in the circuit shown in Figure 1. (6)

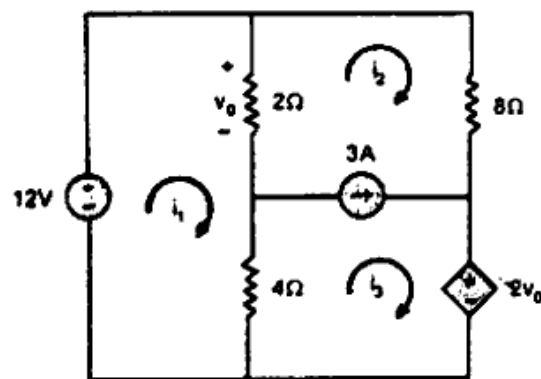


Figure 1

- (b) State and explain Superposition theorem. Show that efficiency in case of maximum power transfer is 50%? (6)
2. (a) Find the Thévenin equivalent circuit external to R_6 in the circuit in Figure 2. (6)

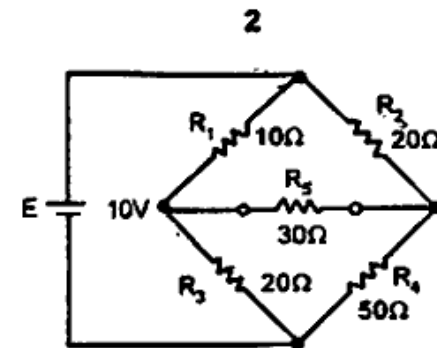


Figure 2

- (b) State and explain Norton Theorem. What are the advantages of hydroelectric power plants? (6)

SECTION - B

3. (a) Find the rms value of the full-wave rectified sine wave given in Figure 3 below. Calculate the average power dissipated in a 6Ω resistor. (6)

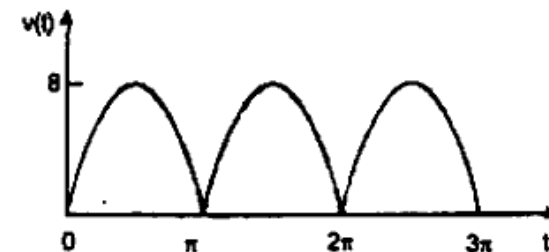


Figure 3

- (b) Three equal star connected inductors take 8 kW at a power factor 0.8 when connected to 460 V, 3 phase, 3 wire supply. Find the load currents if one inductor is short circuited. (6)
4. (a) A balanced star connected load of $8+j6\Omega$, per phase is connected to a 3-phase, 230 V supply. Find the line current power factor, power, reactive volt amperes and total volt-amperes. (6)

[P.T.O.]

- (b) A coil of resistance 2Ω and inductance 0.01 H is connected in series with a capacitor across 200 V mains. What must be the capacitance in order that maximum current occurs at a frequency of (a) 25 (b) 50 (c) 100 Hz (d) Also find the current and the voltage across the capacitor in each case? (6)

SECTION - C

5. (a) What is eddy current loss? What are undesirable effects of eddy currents? How can they be minimized? Mention some applications of eddy currents. (6)
- (b) A moving coil galvanometer of 10Ω resistance has a 50 division scale and indicates $1\mu\text{A}$ per division. Show how it can be used as milliammeter of range 50 mA and as a voltmeter of 5 V . (6)
6. (a) An iron ring of mean length 60 cm has an air gap of 2 mm . It is wound with 300 turns of wire. If the relative permeability of iron is 300 when a current of 0.7 A flows through the coil, find the flux density. (6)
- (b) Classify measuring instruments and clearly differentiate between absolute and secondary instruments. With reference to measuring instruments describe (i) deflecting torque, (ii) controlling Torque and (iii) damping Torque. (6)

SECTION - D

7. (a) 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. (6)

- (b) Derive the e.m.f. equation a D.C. generator. Discuss different methods of speed control of a D.C. motor. (6)
8. (a) What is necessity of a starter for a D.C. motor? Explain with a neat sketch, the working of a 3-point D.C. shunt motor starter? (6)
- (b) Derive an expression for the induced e.m.f. of a transformer. Write a short note on single-phase auto-transformer. (6)

SECTION - E

9. (a) Write the formulas for star-to-delta conversion. (6)
- (b) Draw a general layout of electrical power system network. (6)
- (c) Enlist the accessories used in an electrical installation and differentiate between lighting and power sub-circuits. (6)
- (d) What is meant by leakage flux and fringing? (6)
- (e) What are advantages of capacitor-start and run motor over capacitor-start induction run motor. (6)
- (f) Why is core loss considered to be negligible in the short-circuit test of a transformer? (2×6=12)