



Time: **Three Hours**

Max. Marks: **100**

KEEPING MOBILE PHONE/SMART WATCH, EVEN IN 'OFF' POSITION, IS TREATED AS EXAM MALPRACTICE

General Instructions: Make necessary assumptions wherever necessary.

Answer any TEN Questions

(10 X 10 = 100 Marks)

1. Determine the current supplied by the each battery using Mesh analysis:

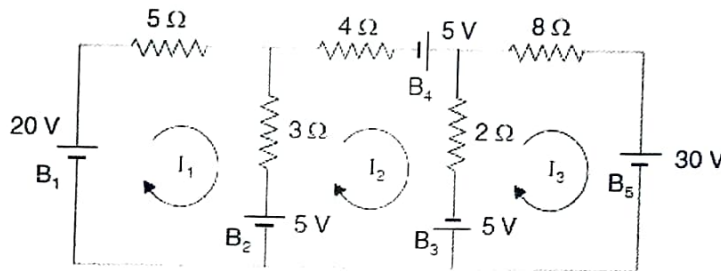


Fig.1

2. Draw Thevenin's equivalent circuit for the fig.2

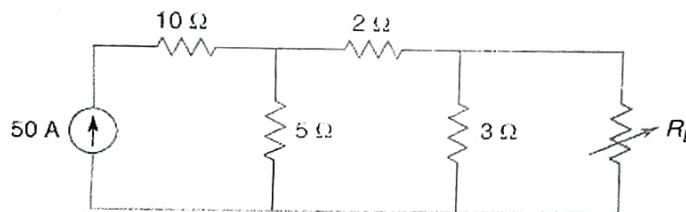


Fig.2

3. A circuit takes a current of 3 A at a power factor of 0.6 lagging when connected to 115 V, 50 Hz supply. Another circuit takes a current of 5 A at a power factor of 0.707 leading when connected to the same supply. If the two circuits are connected in series across a 230 V, 50 Hz supply, calculate (a) current, (b) power consumed, and (c) power factor.
4. A 415 V, 50 Hz, three-phase voltage is applied to three star-connected identical impedances. Each impedance consists of a resistance of 15Ω , a capacitance of $177\mu\text{F}$ and an inductance of 0.1 henry in series. Find the (a) power factor, (b) phase current, (c) line current, (d) active power, (e) reactive power, and (f) total VA. If the same impedances are connected in delta, find the (a) line current, and (b) power consumed.
5. Explain the working principle, construction, and operation of a Brushless DC (BLDC) Motor with a neat diagram. What are the applications of BLDC motor?
6. a) Explain operating principle of three-phase induction motor. Define [5]
synchronous speed of the motor. How does the synchronous speed of rotating field vary if the number of poles are doubled?

- b) A 200 kVA, 10000/400V, 50 Hz single phase transformer has 200 turns on the secondary. Calculate i) Primary and secondary currents ii) Number of Primary turns iii) Maximum value of flux. [5]
7. a) A three-phase balanced system with a line voltage of 202 V feeds a delta-connected load with $Z_p = 25 \angle 60^\circ \Omega$. (a) Find the line current. [5]
 (b) Determine the total power supplied to the load using two wattmeters connected to the A and C phase.
- b) The two-wattmeter method gives $P_1 = 1200 \text{ W}$ and $P_2 = -400 \text{ W}$ for a three-phase motor running on a 240 V line. Assume that the motor load is wye-connected and that it draws a line current of 6 A. Calculate the power factor of the motor and its phase impedance (Z_p). [5]
8. Using K-map, simplify the sum-of-product and realize using logic gates.
 $f(A,B,C,D) = \sum m(0, 1, 3, 5, 7, 8, 9, 11, 13, 15)$
9. Obtain truth table, Boolean expression, and logic diagram of 4:1 multiplexer.
10. Draw the voltage current (VI) characteristics for a Zener diode. For the given circuit in fig.3 with a Zener diode having 8 V as Zener voltage, find the power consumed by the Zener diode for case (i) $R_L = 1.0 \text{ k}\Omega$ and case (ii) $R_L = 2.5 \text{ k}\Omega$.

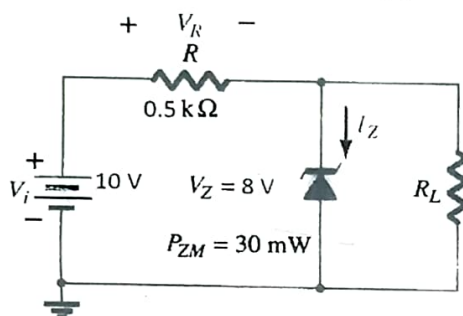


Fig.3

11. Discuss the operation of NPN transistor for common base configuration. Also draw the input and output transistor characteristics for the given configuration.
12. Describe amplitude modulation in communication engineering. Also give the applications of amplitude modulation.

