3 Yr. Degree/4 Yr. Honours 2nd Semester Examination, 2025 (CCFUP)

Subject : Physics

Course : PHYS 2051 (SEC)

(Electrical Circuits and Network Skills)

Time: 2 Hours **Full Marks: 40**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

1. Answer *any five* questions from the following: 2×5=10

(a) Define the resistivity and the conductivity of a material.

(b) Define R.T.C.

(c) Explain : "200 W, 220 V light bulb has a greater resistance than a 100 W 200 V light bulb."

(d) Explain the phase of an alternating current.

(e) Write the mathematical expression for the instantaneous power in an AC circuit.

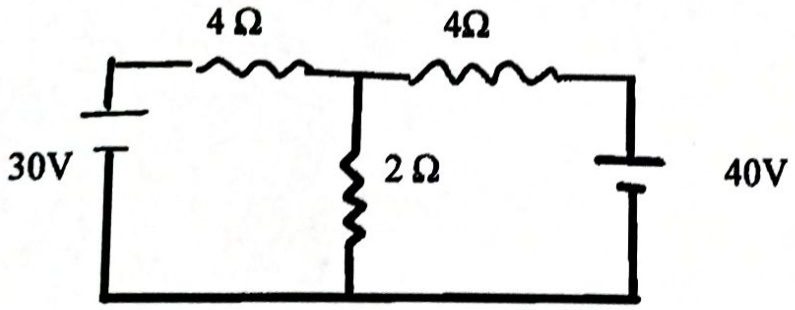
(f) Why a single phase induction motor does not self start?

(g) What is the function of a transformer in a circuit?

(h) Why Zener diode is usually connected in reverse bias?

2. Answer *any two* questions from the following: 5×2=10

(a) Determine the current in all the branches of the following network using loop analysis.



Which is the primary unit of electricity in SI system? 4+1

(b) What should be the bill for the month of March for a heater of resistance 60.5 Ω connected to 220 Volt mains? The cost of energy is Rs. 7 per kWh and the heater is used for 3 hours daily.

5

(c) Describe one wattmeter method for the measurement of power in 3 phase circuit. 5

(d) Describe the points which should be kept in mind for determining the characteristics of the conductor for internal house wiring. What are the causes of being more than zero voltage between the neutral wire and ground? 3+2

3. Answer *any two* questions from the following: 10×2=20

(a) Describe the control of speed of a DC motor by constant torque loads and constant horse power. Explain about Star and Delta connected three phase balanced circuits. 4+6

(b) Write a note on electrical safety. Where are the primary and secondary coils of a transformer located? When does the maximum efficiency occur? What is ''hysteresis loss related'' to a transformer?

4+2+1+3

(c) What is the peak inverse voltage? What is the need of protection zones in a power system? List out the types of faults in a power system. What is meant by neutral earthing? 3+2+4+1

(d) (i) What are apparent power, real power and reactive power of a series R-L circuit. Give the steps to draw the phasor diagram of RL circuit.

(ii) An LCR series circuit contains inductance L Henry, capacitance C Farad and resistance R Ohm. Derive the expression for impedance of an AC current of $I = I_0 \text{Sin}\omega t$. (3+2)+5
