

Reg. No. :

**Question Paper Code : 60032**

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Second Semester

Electronics and Communication Engineering

EC 3251 — CIRCUIT ANALYSIS

(Common to : Electronics and Telecommunication Engineering)

(Regulations 2021)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Ten coulombs of charge flow past a given point in a wire in 2s. How many amperes of current is flowing?
2. Define active and passive elements and give examples.
3. State Maximum power transfer theorem.
4. Draw the dual of the network shown in Figure 1

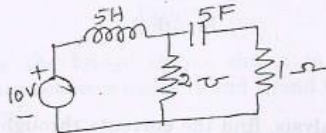


Figure 1

5. Determine the average power delivered to the circuit consisting of an impedance  $z = (5 + j8)\Omega$  when the current flowing through the circuit is  $I = 5\sqrt{30}$  Amps.
6. For the circuit shown in Figure 2, find the average power delivered by the dependent current source.

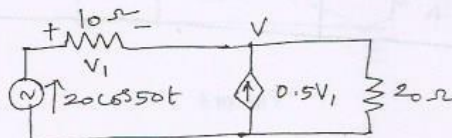


Figure 2

7. Write the mathematical expression for unit step function and draw the pattern of it.
8. Determine the Quality factor of a coil for the series circuit consisting of  $R = 10\Omega$ ,  $L = 0.1\text{H}$  and  $C = 10\ \mu\text{F}$ .
9. Two inductively coupled coils have self inductances  $L_1 = 50\ \text{mH}$  and  $L_2 = 200\ \text{mH}$ . If the co-efficient of coupling is 0.5, find the value of mutual inductance between the coils.
10. List out the properties of tree of a graph.

PART B — (5 × 13 = 65 marks)

11. (a) Using mesh analysis determine the voltage  $V_s$  which given a voltage of 50 V across the  $10\Omega$  resistor as shown in Figure 3

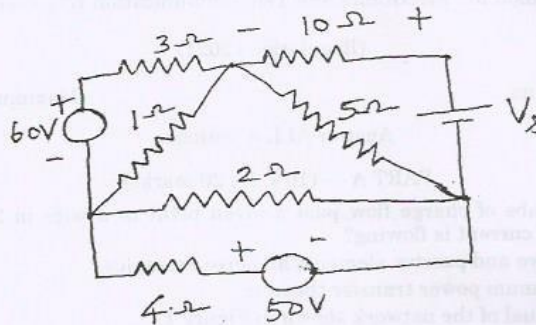


Figure 3

Or

- (b) Using nodal analysis, find the currents through the resistances  $R_3$  and  $R_4$  for the circuit shown in Figure 4

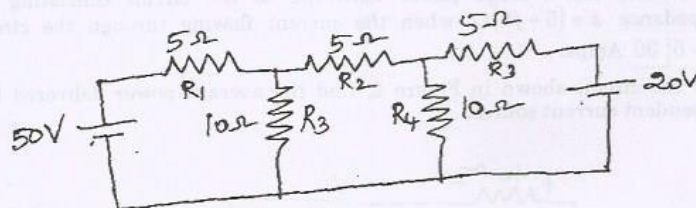


Figure 4

12. (a) Find the voltage across the  $2\Omega$  resistor shown in Figure 5 using superposition theorem.

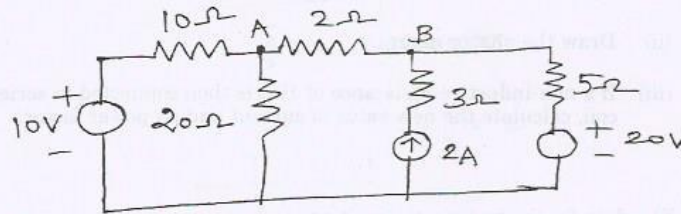


Figure 5

Or

- (b) (i) Determine the resistance between nodes A and B in the circuit shown in Figure 6 (8)

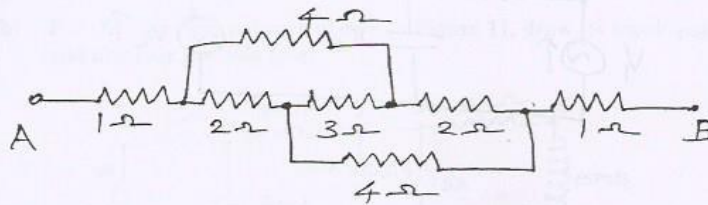


Figure 6

- (ii) Consider the bridge circuit shown in Figure 7. Determine the resistance between nodes A and B and the current supplied by the 24V supply. (8)

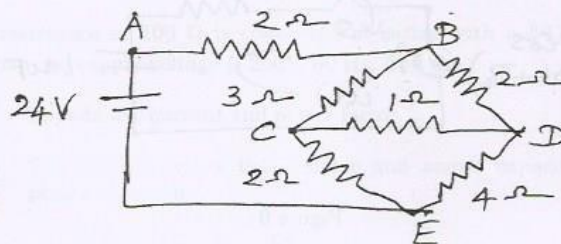


Figure 7

13. (a) A coil has a resistance of  $5\Omega$  and an inductance of  $31.8\text{ mH}$ .
- Calculate the current taken by the coil and power factor when connected to  $200\text{ V}$ ,  $50\text{ Hz}$  supply.
  - Draw the phasor diagram.
  - If a non-inductive resistance of  $10\Omega$  is then connected in series with coil, calculate the new value of current and its power factor.

Or

- (b) The data for the two mesh circuit are

$$V_1 = 110 \angle 0^\circ \text{ V and } V_2 = -120 \angle 45^\circ \text{ V, } R = 4\Omega, X_L = 4\Omega, X_C = 3\Omega$$

Determine the current through and voltage across the capacitance

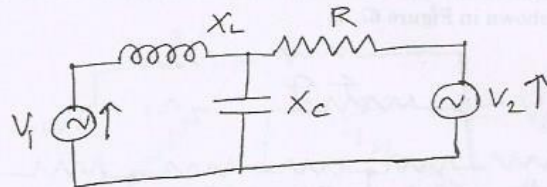


Figure 8

14. (a) In the circuit shown in Figure 9, determine the complete solution for the current when the switch  $S$  is closed at  $t=0$ . Applied voltage is  $v(t) = 50 \cos\left(10^2 t + \frac{\pi}{4}\right)$  volts, Resistance  $R = 10\Omega$  and capacitance  $C = 1\mu\text{F}$ .

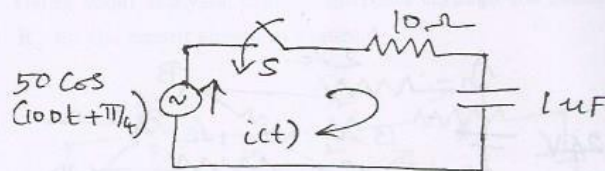


Figure 9

Or

- (b) A coil of resistance  $10\Omega$  and inductance  $0.1\text{ H}$  is connected in series with  $150\ \mu\text{F}$  capacitor across  $200\text{V}$ ,  $50\text{ Hz}$  supply.

Calculate :

- (i) Inductive reactance; capacitive reactance, impedance, current and power factor and
- (ii) The voltage across the coil and capacitor.