CBCS SCHEME

USN | | | | | | | | | | |

18EE32

Third Semester B.E. Degree Examination, Dec.2024/Jan.2025
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Differentiate between :
i) Active and passive elements
ii) Unilateral and bilateral elements
iii) Linear and non-linear elements
iv) Independent and dependent sources
v) Ideal and practical sources. **(10 Marks)**

b. Find the current through the 4Ω resistor using source transformation technique and hence determine the power absorbed in it for the circuit given in Fig.Q1(b).

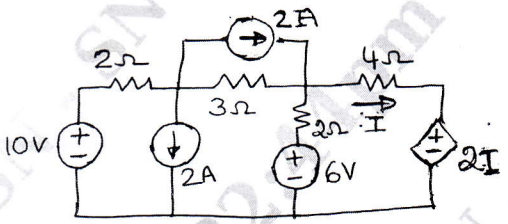

Fig.Q1(b) **(10 Marks)**

OR

2 a. What is Supernode? **(03 Marks)**

b. Find the equivalent RPQ between P and Q for the circuit given in Fig.Q2(b).

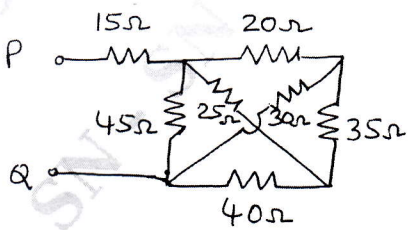

Fig.Q2(b) **(08 Marks)**

c. Find the Mesh currents for the circuit shown in Fig.Q2(c).

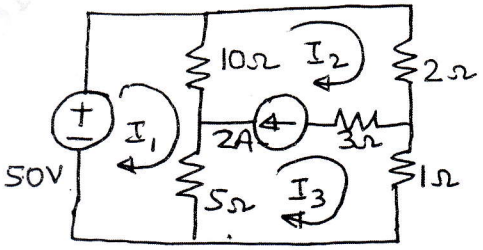

Fig.Q2(c) **(09 Marks)**

Module-2

3 a. State and explain superposition theorem. **(05 Marks)**

b. Find the current through the 24Ω resistor using thevenin theorem of the circuit shown in Fig.Q3(b).

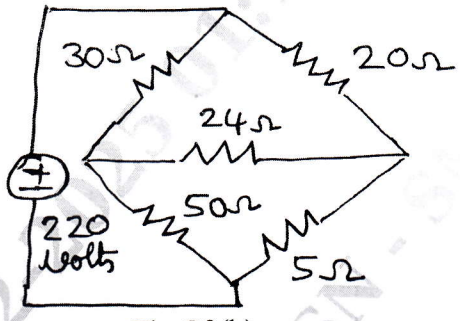

Fig.Q3(b) **(08 Marks)**

c. Determine the value of Z_L for which power transferred form the source is maximum for the circuit shown in Fig.Q3(c).

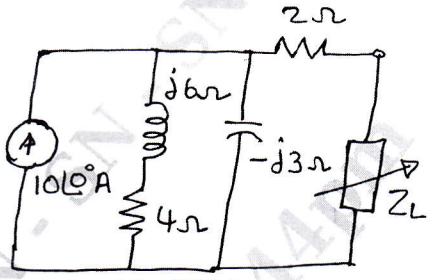

Fig.Q3(c) **(07 Marks)**

OR

4 a. Find the current through the 10Ω resistor for the circuit shown in Fig.Q4(a). Use Millman's theorem.

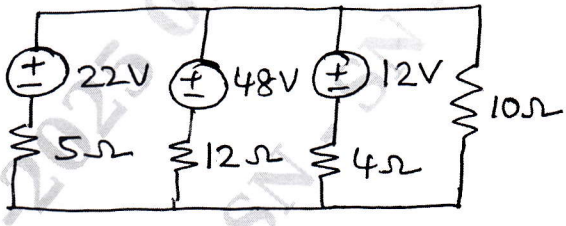

Fig.Q4(a) **(06 Marks)**

b. Use Norton's theorem to find I_x for the circuit shown in the Fig.Q4(b).

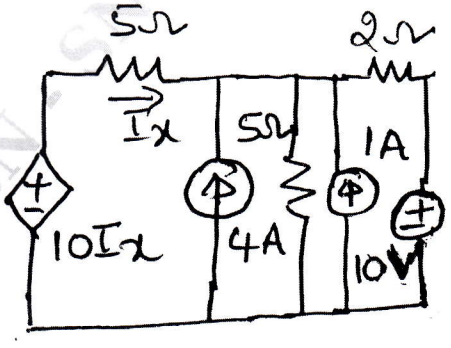

Fig.Q4(b) **(08 Marks)**

c. State and explain reciprocity theorem. **(06 Marks)**

Module-3

5 a. Show that the resonance frequency is the geometric mean of the two half power frequencies. **(06 Marks)**

b. An impedance coil having a resistance of 20Ω and an inductance of 0.02H is connected in series with capacitance of 0.01μF. Calculate :
i) Q-factor
ii) Resonant frequency
iii) The half power frequencies. **(06 Marks)**

c. In the circuit shown in the Fig.Q5(c), the switch is closed at t = 0. Assuming all initial conditions as zero, find i(t), $\frac{di(t)}{dt}$ and $\frac{d^2i(t)}{dt^2}$ at $t = 0^+$.

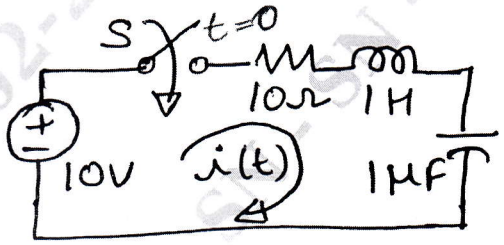

Fig.Q5(c) **(08 Marks)**

OR

6 a. Determine the resonance frequency for the parallel circuit given in Fig.Q6(a).

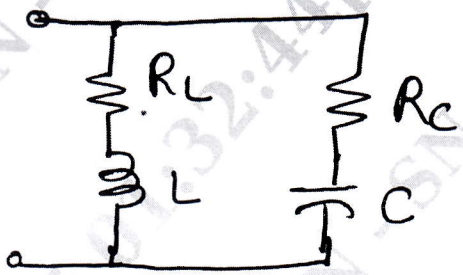

Fig.Q6(a) **(06 Marks)**

b. In the networks shown in Fig.Q6(b), the switch S is moved from the position 1 to the position 2 at t = 0, steady state condition having reached before switching. Find i(t), $\frac{di(t)}{dt}$ and $\frac{d^2i(t)}{dt^2}$ at $t = 0^+$. **(10 Marks)**

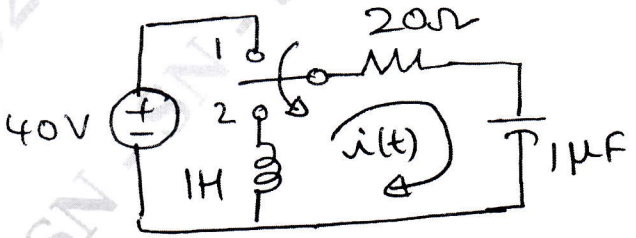

Fig.Q6(b)

c. Define and derive the expression for dynamic impedance. Refer Fig.Q6(b). **(04 Marks)**

Module-4

7 a. State and explain initial and final value theorem. **(10 Marks)**

b. Find the Laplace transforms of : i) sinh wt ii) cos wt. **(04 Marks)**

c. State and explain first shifting theorem. **(06 Marks)**

OR

8 a. Find the Lapalce transform of the periodic waveform shown the Fig.Q8(a).

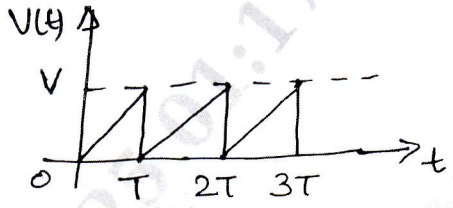

Fig.Q8(a) **(10 Marks)**

b. Find the initial value of : i) $10\ell^{5t}$ ii) $5 - \ell^{-3t}$. **(05 Marks)**

c. Find the inverse Lapalce therefore of :

$$F(s) = \frac{5}{s^2 - 5s + 6}.$$ **(05 Marks)**

Module-5

9 a. A 400 V, 3-phase supply feeds an unbalanced 3-wire star connected load consisting of impedances $Z_R = 7\angle 10°\Omega$, $Z_Y = 8\angle 30°\Omega$ and $Z_B = 8\angle 50°\Omega$. Assume phase sequence as RYB. Determine the line currents. **(10 Marks)**

b. Define Y-parameters and express Z-parameters in terms of Y- parameters. **(10 Marks)**

OR

10 a. In the network shown in Fig.Q10(a), find the Y and Z- parameters.

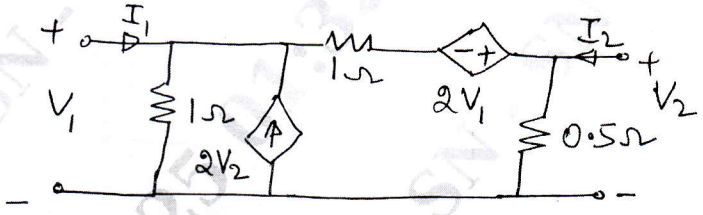

Fig.Q10(a) **(10 Marks)**

b. Define ABCD parameters. Establish the relationship between ABCD and Z- parameters given ABCD parameters. **(10 Marks)**

* * * * *