CBCS SCHEME

USN

21EE33

Third Semester B.E. Degree Examination, June/July 2023
Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 100

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

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

Module-1

1 a. Write a note on :
i) Active element and passive element
ii) Ideal source and practical sources. **(10 Marks)**

b. Find power delivered by 50V voltage source using source transformation for the Fig.Q1(b).

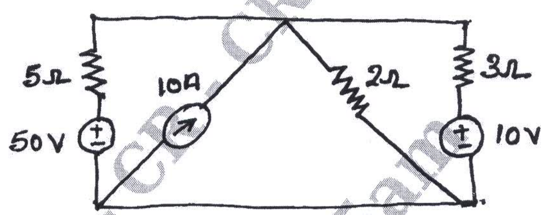

Fig.Q1(b) **(10 Marks)**

OR

2 a. Find power dissipated in 10Ω resistor shown in Fig.Q2(a) by Nodal voltage method i.e across ab.

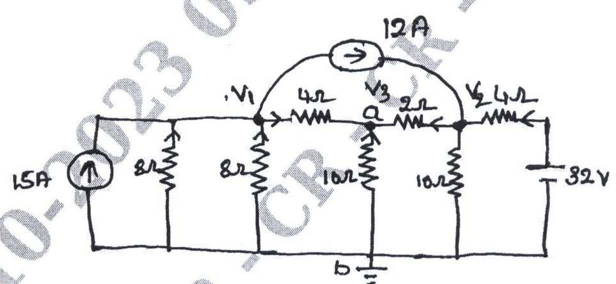

Fig.Q2(a) **(10 Marks)**

b. Determine equivalent resistance using Y-Δ transformation for the circuit shown in Fig.Q2(b).

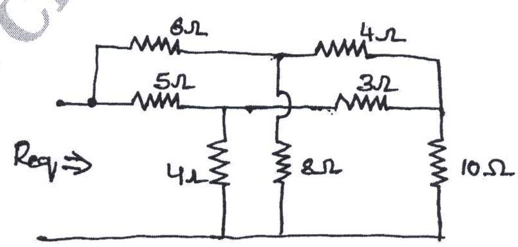

Fig.Q2(b) **(10 Marks)**

Module-2

3 a. Define superposition theorem and find 'va' using the principle of superposition theorem shown in Fig.Q3(a).

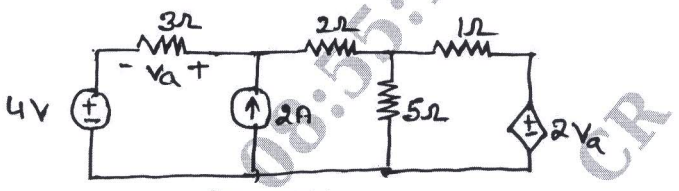

Fig.Q3(a) **(10 Marks)**

b. Define reciprocity theorem and find 'v_x' in the circuit shown in Fig.Q3(b) and hence verify reciprocity theorem.

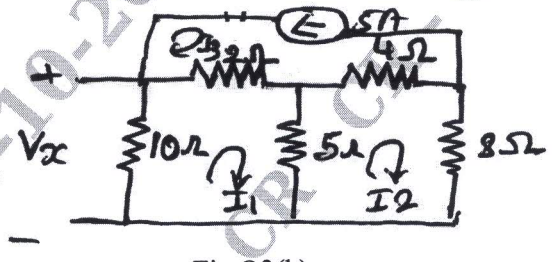

Fig.Q3(b) **(10 Marks)**

OR

4 a. State and explain maximum power transfer theorem when load impedance is equal to pure variable resistance. **(10 Marks)**

b. Find the current through '16Ω' resistor in circuit shown in Fig.Q4(b) using Norton's theorem.

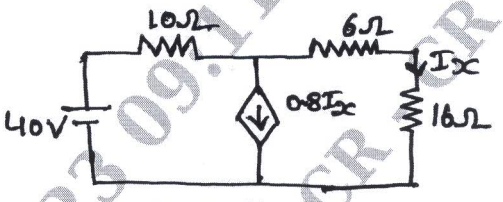

Fig.Q4(b) **(10 Marks)**

Module-3

5 a. The switch K is changed from position 1 to position 2 at t = 0 steady state condition have been reached at position 1 find the values of i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$.(Refer Fig.Q5(a)).

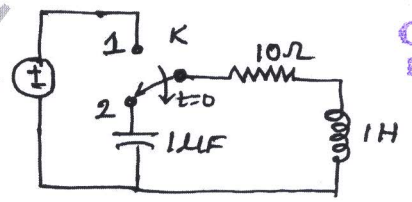

Fig.Q5(a) **(10 Marks)**

b. Show that for a series RLC resonant circuit, the selectivity $Q_0 = \frac{f_0}{f_2 - f_1}$ where $f_0 \rightarrow$ resonant frequency and f_1, f_2 are half power frequency. **(10 Marks)**

OR

6 a. A constant voltage of frequency 1MHz is applied to an inductor coil in series with capacitor, when the capacitor is said at 500pF the current as its maximum value, while the current is reduced to one half when capacitance is 600pF find the following :

i) The resistance and inductance of the coil

ii) Q-factor of the coil. **(10 Marks)**

b. In the networks shown in Fig.Q6(b), $v_1(t) = e^{-t}$ for $t \geq 0$ is zero for all $t < 0$, if capacitor is initially uncharged determine the value of $\frac{d^2v_2}{dt^2}$ and $\frac{d^3v_2}{dt^3}$ at $t = 0^+$.

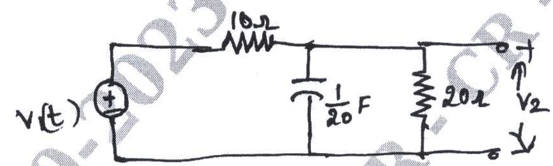

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. State and prove initial and final value theorem in Laplace transformation. **(10 Marks)**

b. Using initial and final value theorem, where they apply, find f(0) and f(∞) for the following function : $F(s) = \frac{s^3 + 7x^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}$. **(10 Marks)**

OR

8 a. Obtain the Laplace transfer of the function shown in Fig.Q8(a).

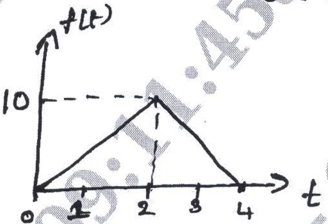

Fig.Q8(a) **(10 Marks)**

b. Derive the relation between unit step and unit ramp function. **(10 Marks)**

Module-5

9 a. A 3ϕ, 4 wire system 150V, CBA sequence has Y-connected load with $Z_A = 6\angle 0°$, $Z_B = 6\angle 30°$ and $Z_C = 5\angle 45°\ \Omega$. Obtain all line current and draw a phasor diagram. **(10 Marks)**

b. Find y parameter of two port networks shown in Fig.Q9(b).

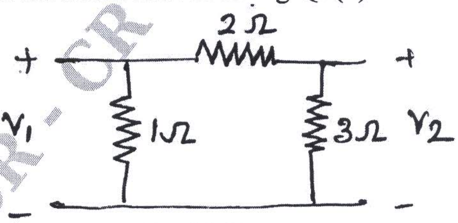

Fig.Q9(b) **(10 Marks)**

OR

10 a. Express 'y' parameter interm of 'Z' parameter. **(10 Marks)**

b. Determine the line current and total power supplied to a delta connected load of $Z_{ab} = 10\angle 60°\ \Omega$, $Z_{bc} = 20\Omega\angle 90°$, $Z_{ca} = 25\angle 30°\ \Omega$. Assume a 3-phase, 400v, ABC system. **(10 Marks)**