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CBCS SCHEME

USN

17EE32

Third Semester B.E. Degree Examination, Dec.2019/Jan.2020
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. Derive the expression for Delta-star transformation. **(06 Marks)**

b. Using source transformation, find the power delivered by 50V source shown in Fig.Q.1(b). **(06 Marks)**

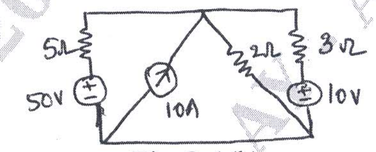

Fig.Q.1(b)

c. Find the voltage a/c 20Ω resistor in the network shown in Fig.Q.1(c). **(08 Marks)**

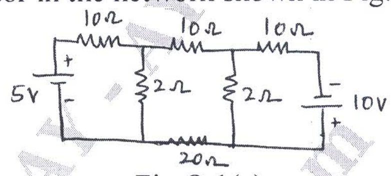

Fig.Q.1(c)

OR

2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a). **(06 Marks)**

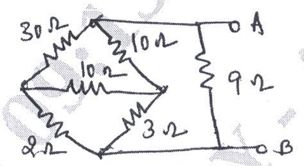

Fig.Q.2(a)

b. Find the node voltages V_1, V_2 and V_3 in the circuit shown in Fig.Q.2(b) using nodal analysis. **(08 Marks)**

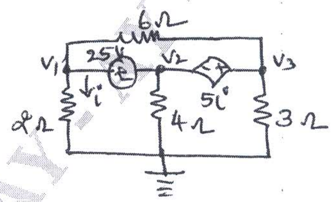

Fig.Q.2(b)

c. Draw the dual of the network shown in Fig.Q.2(c). **(06 Marks)**

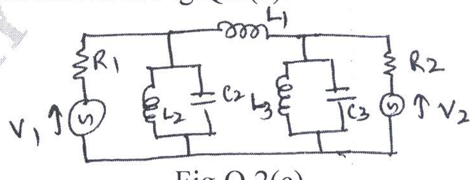

Fig.Q.2(c)

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Module-2

3 a. State and explain superposition theorem. **(06 Marks)**

b. For the circuit shown in Fig.Q.3(b) obtain Thevinins equivalent circuit as seen from terminals p-q. **(08 Marks)**

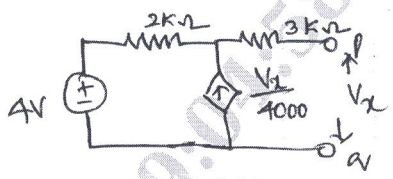

Fig.Q.3(b)

c. Find the voltage 'V_x' and apply reciprocity theorem to the networks shown in Fig.Q.3(c). **(06 Marks)**

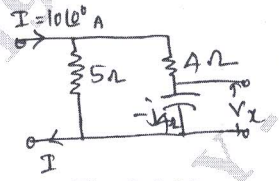

Fig.Q.3(c)

OR

4 a. State and explain Norton's theorem. **(06 Marks)**

b. Find the current I_a in the circuit shown in Fig.Q.4(b) by applying superposition theorem. **(08 Marks)**

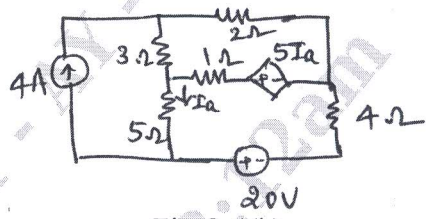

Fig.Q.4(b)

c. Find the current through 16Ω resistance using Morton's theorem for Fig.Q.4(c) **(06 Marks)**

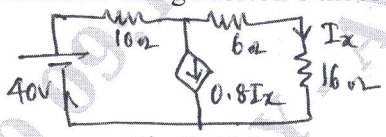

Fig.Q.4(c)

Module-3

5 a. Show that in series resonant circuit the resonant frequency is equal to the geometric mean of half power frequencies. **(06 Marks)**

b. A circuit shown in Fig.Q.5(b), the switch 'K' is changed from position 1 to 2 at t = 0. The steady state having reached before closing the switch. Find the values of $i(t), \frac{di(t)}{dt}$ and $\frac{d^2i(t)}{dt^2}$ at $t = 0^+$ **(08 Marks)**

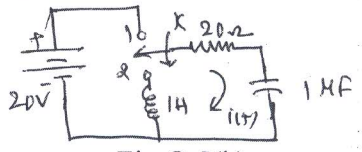

Fig.Q.5(b)

c. A series RLC circuit has R = 2Ω, L = 2mH and C = 10μF. Calculate Q factor, bandwidth, resonant frequency and half power frequencies. **(06 Marks)**

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OR

6 a. Show that a parallel resonant circuit will resonate for all frequencies when $R_L = R_C = \sqrt{\frac{L}{C}}$? **(06 Marks)**

b. In the circuit shown in Fig.Q.6(b) initially switch 'K' is kept open for long time. At t = 0, switch K is closed. Obtain the expression for current in the circuit for t > 0.

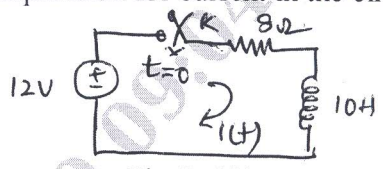

Fig.Q.6(b) **(06 Marks)**

c. Find the value of R_1 such that the circuit shown in Fig.Q.6(c) is resonant.

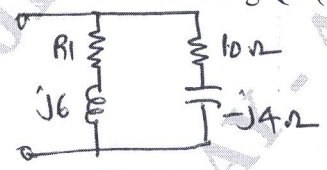

Fig.Q.6(c) **(08 Marks)**

Module-4

7 a. Find the inverse Laplace transform of the following:

i) $F(s) = \frac{s+2}{s(s+3)(s+4)}$ ii) $F(s) = \frac{(s-2)}{s(s+1)^3}$ **(06 Marks)**

b. State and prove initial value and final value theorem. **(08 Marks)**

c. Obtain the Laplace transform of the gate function shown in Fig.Q.7(c) **(06 Marks)**

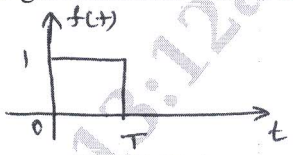

Fig.Q.7(c)

OR

8 a. Using Laplace transform determine the current in circuit shown in Fig.Q.8(a) when switch K is closed at t = 0. Assume zero initial condition. **(06 Marks)**

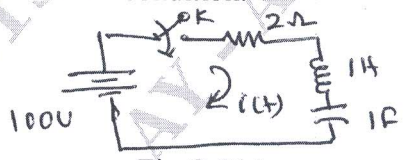

Fig.Q.8(a)

b. Find the Laplace transform of periodic functions shown in Fig.Q.8(b) **(08 Marks)**

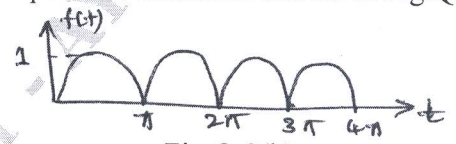

Fig.Q.8(b)

c. Find initial value and final value of the following equations:

i) $F(s) = \frac{s^3 + 7s^2 + 5}{s(s^3 + 3s^2 + 4s + 2)}$ ii) $F(s) = \frac{s(s+4)(s+8)}{(s+1)(s+6)}$ **(06 Marks)**

Module-5

9 a. An unbalanced 3-phase, 4-wire star connected load has balanced voltages of 208V, with ABC phase sequence. Calculate the line currents and neutral current.

$Z_A = 10\Omega;\quad Z_B = 15\angle 30\Omega;\quad Z_C = 10\angle -30°\Omega$ s **(06 Marks)**

b. Derive Z-parameters interms of y and h-parameters. **(08 Marks)**

c. Find Y-parameters for the network shown in Fig.Q.9(c) **(06 Marks)**

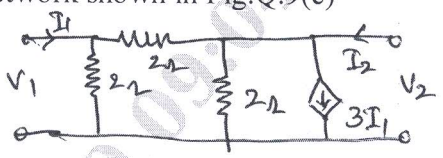

Fig.Q.9(c)

OR

10 a. Determine the line currents and total power supplied to a delta connected load of $Z_{ab} = 10\angle 60°\Omega$, $Z_{bc} = 20\angle 90°\Omega$, $Z_{ca} = 25\angle 30°\Omega$. Assume 3-phase 400V, ABC sequence. **(06 Marks)**

b. Determine the transmission parameters for the networks shown in Fig.Q.10(b).

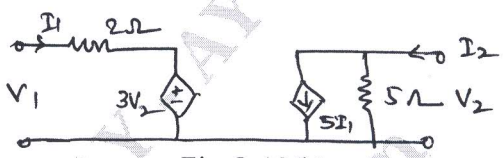

Fig.Q.10(b) **(08 Marks)**

c. Define Z-parameters and Y-parameters and write equivalent circuits. **(06 Marks)**

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