CBCS SCHEME

USN | | | | | | | | | |

17EE32

Third Semester B.E. Degree Examination, Jan./Feb. 2021
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. Define and distinguish the following network elements :
   i) Active and passive elements
   ii) Linear and nonlinear circuits
   iii) Unilateral and Bilateral circuits
   iv) Lumped and distributed elements. **(08 Marks)**

b. Reduce the network shown in Fig.Q1(b) to a single voltage source in series with a resistance using source transformations.

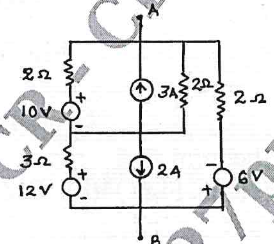

Fig.Q1(b) **(06 Marks)**

c. Derive an expression for Δ to Y transformations. **(06 Marks)**

OR

2 a. The network contains two voltage sources v_1 and v_2 as shown in Fig.Q2(a) with $v_1 = 30\angle 0°$ volts. Determine v_2, such that current in $2 + j3\Omega$ impedance is zero. Use Mesh analysis.

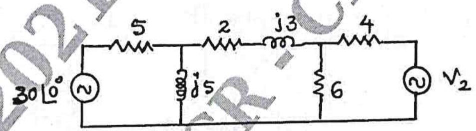

Fig.Q2(a) **(06 Marks)**

b. Determine v_1 and v_2 for the circuit shown in Fig.Q2(b) by using node analysis.

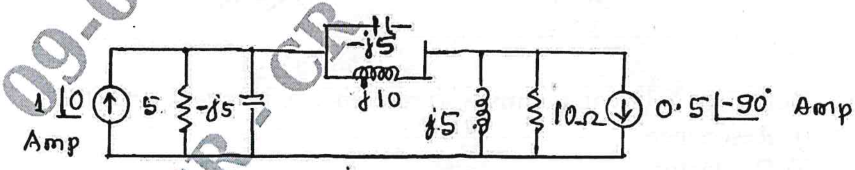

Fig.Q2(b) **(08 Marks)**

c. For the network shown in Fig.Q2(c), draw its dual network.

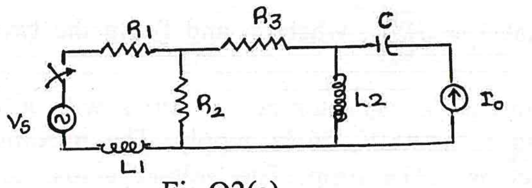

Fig.Q2(c) **(06 Marks)**

Module-2

3 a. State the super position theorem. **(06 Marks)**

b. In the circuit of Fig.Q3(b), use super position principle to determine the value of i_x.

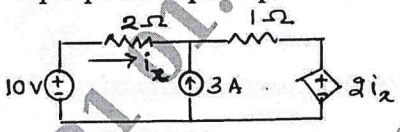

Fig.Q3(b) **(06 Marks)**

c. Find the current i_x and hence verify reciprocity theorem for the network in Fig.Q3(c).

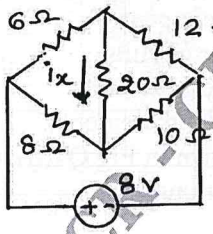

Fig.Q3(c) **(08 Marks)**

OR

4 a. State the Thevenin's theorem. **(06 Marks)**

b. For the network shown in Fig.Q4(b). Obtain the Thevenin's equivalent as seen from the terminals p and q.

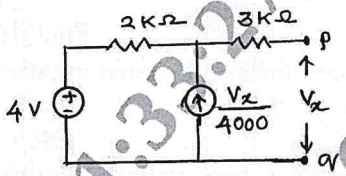

Fig.Q4(b) **(08 Marks)**

c. Find the Norton's equivalent for the circuit shown in Fig.Q4(c).

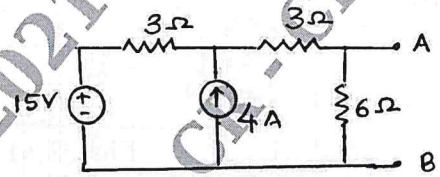

Fig.Q4(c) **(06 Marks)**

Module-3

5 a. Define the following terms with reference to resonant circuit.
i) Resonance
ii) Q – factor
iii) Selectivity
iv) Bandwidth. **(08 Marks)**

b. Prove that $f_r = \sqrt{f_1 f_2}$, where f_1 and f_2 are the two half power frequencies of a resonant circuit. **(06 Marks)**

c. A resistor and a capacitor are in series with a variable inductor. When the circuit is connected to a 200V, 50Hz supply. The maximum current obtainable by varying the inductance is 0.314 Amp. The voltage across the capacitor is 300V. Find the circuit constants. **(06 Marks)**

OR

6 a. In the network of Fig.Q6(a), K is changed from position a to b at t = 0. Solve for $i, \frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0+$, if $R = 1000\Omega$, $L = 1H$, $c = 0.1\mu F$ and $v = 100volts$.

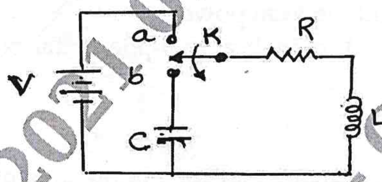

Fig.Q6(a) **(10 Marks)**

b. In the network shown in Fig.Q6(b), the switch K is opened at t = 0. At t = 0+, solve for the value of $v, \frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$, if $I = 10$ Amp, $R = 1000\Omega$ and $c = 1\mu F$.

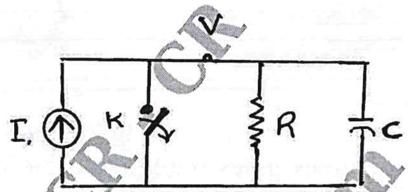

Fig.Q6(b) **(10 Marks)**

Module-4

7 a. Find the Laplace transform of the periodic wave form as shown in Fig.Q7(a).

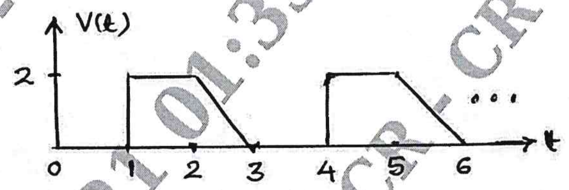

Fig.Q7(a) **(10 Marks)**

b. Find the Laplace transform of the periodic wave form as shown in Fig.Q7(b).

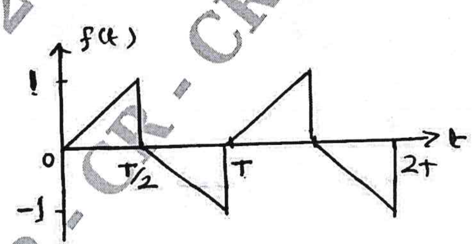

Fig.Q7(b) **(10 Marks)**

OR

8 a. State and prove :
i) Initial value theorem
ii) Final value theorem. **(10 Marks)**

b. Calculate i(0+) using initial value theorem, given that the transform function of the current $I(s) = \frac{2s+5}{(s+1)(s+2)}$. Determine i(t) and obtain its value at t = 2sec. **(10 Marks)**

Module-5

9 a. A three – phase, four wire, 208 volts ABC system supplies a star connected load in which $Z_A = 10\angle 0^\circ$ ohms $Z_B = 15\angle 30^\circ$ ohms and $Z_C = 10\angle -30^\circ$ ohms. Find the line currents, the neutral current and the total power. **(12 Marks)**

b. Explain the method of analyzing 3-phase star connected load by using Milliman's theorem. **(08 Marks)**

OR

10 a. Obtain Z and Y parameters for the circuit shown in Fig.Q10(a).

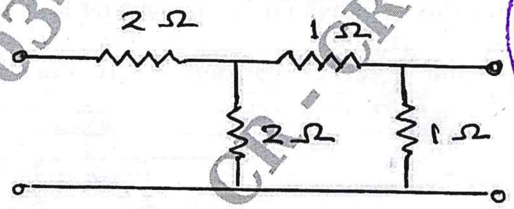

Fig.Q10(a) **(10 Marks)**

b. The following equations gives the relationship between the voltage and currents of a two-port network $I_1 = 0.25v_1 - 0.2v_2$, $I_2 = -0.2v_1 - 0.1v_2$. Obtain T–parameters. **(10 Marks)**

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