# CBCS Scheme

USN | | | | | | | | | | |  **15EE32**

## Third Semester B.E. Degree Examination, Dec.2016/Jan.2017
## Electric Circuit Analysis

Time: 3 hrs. Max. Marks: 80

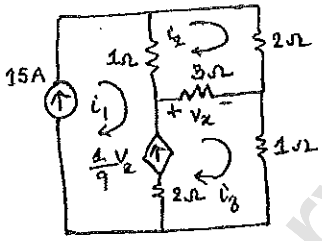
**Note: Answer any FIVE full questions, choosing one full question from each module.**

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

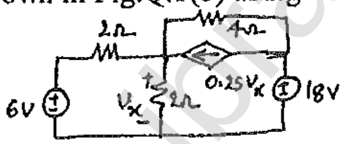
1 a. Find the three unknown currents in the circuit shown in Fig.Q.1(a) using mesh analysis. **(08 Marks)**

Fig.Q.1(a)




b. Find $V_x$ in the circuit diagram shown in Fig.Q.1(b) using source transformation. **(08 Marks)**

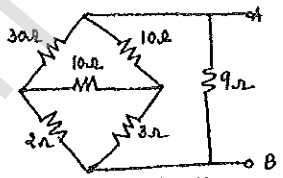
Fig.Q.1(b)




**OR**

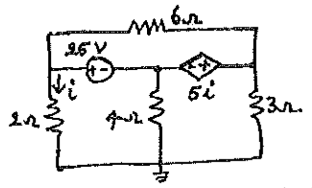
2 a. Determine the equivalent resistance between the terminals AB for the network shown in Fig.Q.2(a). **(05 Marks)**

Fig.Q.2(a)




b. Find the node voltage $V_1$, $V_2$ and $V_3$ in circuit diagram shown in Fig.Q.2(b) using nodal analysis. **(06 Marks)**

Fig.Q.2(b)




c. A series connected RLC circuit has R = 4Ω, L = 25mH. Calculate the value of C such that Q = 50. Also find resonant frequency, half power frequencies. **(05 Marks)**

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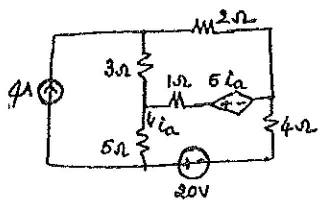
### Module-2

3 a. Find the current $i_a$ in the circuit show in Fig.Q.3(a) by applying superposition theorem. **(06 Marks)**

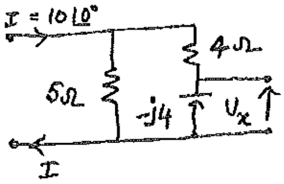
Fig.Q.3(a)




b. Obtain the condition for an alternating voltage source to transfer maximum power to the load when the load impedance is the complex conjugate of the source impedance. **(04 Marks)**

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

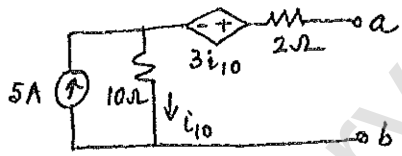
Fig.Q.3(c)




**OR**

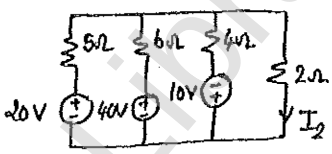
4 a. For the network shown in Fig.Q.4(a), obtain the Norton's equivalent as seen from the terminals a – b. **(08 Marks)**

Fig.Q.4(a)




b. Determine the current $I_2$ by applying Millman's theorem for the network shown in Fig.Q.4(b). **(08 Marks)**

Fig.Q.4(b)

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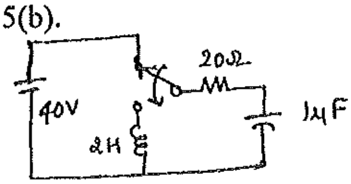
## Module-3

5 a. Show the behaviour of R, L, C elements at the time of switching at t = 0 both at $t = 0^+$ and $t = \infty$. **(08 Marks)**

b. Determine i, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ when the switch K is moved from position 1 to 2 at t = 0 for the network shown in Fig.Q.5(b). **(08 Marks)**

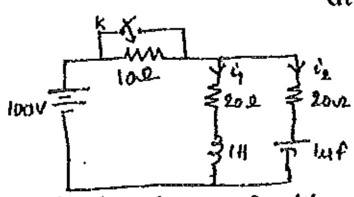
Fig.Q.5(b)




**OR**

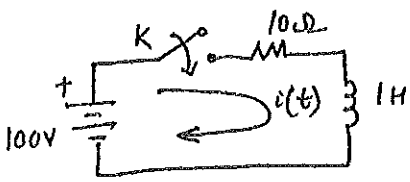
6 a. In the network shown in Fig.Q.6(a) a steady state is reached with switch 'K' open. At time t = 0, the switch is closed. Find at $t = 0^+$, $i_1(t)$, $i_2(t)$ and $\frac{di_1(t)}{dt}$. **(08 Marks)**

Fig.Q.6(a)




b. In the network shown Fig.Q.6(b) K is closed at t = 0 with zero current in the inductor. Find: i(t), $\frac{di(t)}{dt}$ at $t = 0^+$ and obtain an expression for i(t) at $t \geq 0^+$ by classical method. **(08 Marks)**

Fig.Q.6(b)

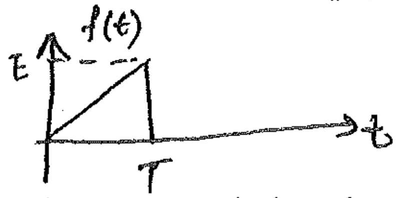


## Module-4

7 a. State and prove shifting theorem. **(06 Marks)**

b. Find the Laplace transform of the waveform shown in Fig.Q.7(b). **(06 Marks)**

Fig.Q.7(b)




c. Apply the initial and final value theorem respectively to the s-domain equations of $I_1(s)$ and $I_2(s)$ given,

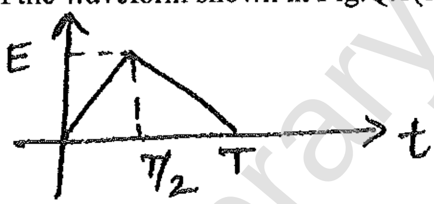
i) $I_1(s) = \dfrac{6.67(s+250)}{s(s+166.7)}$ ii) $I_2(s) = \dfrac{6.67}{s+166.7}$ **(04 Marks)**

**OR**

8 a. Find the Laplace transform of the shifted function given i) $10\ u(t-2)$ ii) $10\ \delta(t-2)$ iii) $10\ r(t-2)\ u(t-2)$ iv) $10 \sin(t-2)\ u(t-2)$. Also sketch these functions. **(08 Marks)**

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

Fig.Q.8(b)

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## Module-5

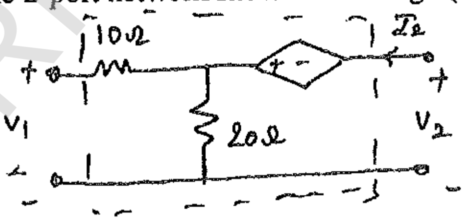
9 a. An unbalanced 3-phase, 4-wire star connected load, has balanced voltages of 208V with ABC phase sequence. Calculate the line currents and the neutral current.

$Z_A = 10\Omega$, $Z_B = 15\angle 30^\circ\ \Omega$, $Z_C = 10\angle -30^\circ\ \Omega$. **(06 Marks)**

b. Define Z and Y parameters. **(04 Marks)**

c. Find the T parameters for the 2-port network shown in the Fig.9(c). **(06 Marks)**

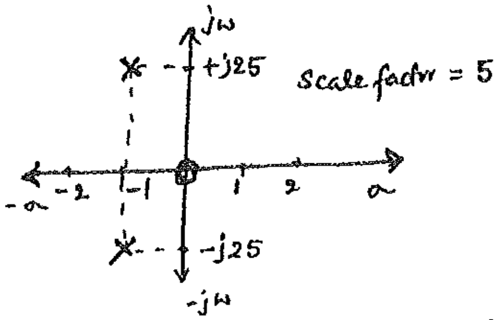
Fig.Q.9(c)




**OR**

10 a. A series RLC circuit has for its driving point admittance pole-zero diagram as shown in Fig.Q.10(a). Find the valves of R – L – C. **(08 Marks)**

Fig.Q.10(a)




b. Find the response i(t) when input signal i) $5\delta(t-2)$ ii) $5u(t-2)$ is given to a R – L series circuit. Assume initial current through the inductor to be zero. **(08 Marks)**

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