GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
CIRCUIT THEORY AND NETWORKS (Backlog)
EE301

TIME ALLOTTED: 3HR   **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any *ten* from the following, choosing the correct alternative of each question: **10×1=10**

                                                                 Marks   **CO No**

1(i)   The equivalent resistance of the figure between x and y is   1   CO1

       a)   30Ω
       b)   50Ω
       c)   60Ω
       d)   10Ω

1(ii)   The Superposition Theorem is applicable to   1   CO1
       a)   Linear response only
       b)   Linear and nonlinear response only
       c)   Linear, Non-linear and time variant response only
       d)   Linear, Non-linear and time invariant response only

1(iii)   A R-C has a time constant given by   1   CO3
       a)   R/C
       b)   C/R
       c)   1/(RC)
       d)   RC

1(iv)   Laplace transform analysis gives   1   CO2
       a)   Time domain response onty
       b)   Frequency domain response only
       c)   Both A and B
       d)   None of these

1(v)   The value of the impulse function $\delta(t)$ at t=0 is   1   CO2
       a)   0
       b)   ∞
       c)   1
       d)   indeterminate.

1(vi)   When a unit impulse voltage is applied to an inductor of 1H, the energy supplied by the source is   1   CO1
       a)   Infinite
       b)   0
       c)   1/2J
       d)   d) 1J

1(vii) The no of Iinks for a graph having n nodes and b branches are   1   CO5
   a) b-n+1
   b) n-b+1
   c) b+n-1
   d) b+n

1(viii) A tie set matrix has 3 rows and 7 branches. The number of twigs is   1   CO5
   a) 3
   b) 5
   c) 2
   d) 4

1(ix) A two port network is reciprocal if and only if   1   CO4
   a) $Z_{11}=Z_{22}$
   b) BC-AD= -1
   c) A=D
   d) $Y_{11}=Y_{21}$

1(x) For maximum power to be transferred between the load and the source   1   CO1
the condition is
   a) $R_S>R_L$
   b) $R_S=R_L$
   c) $R_S<R_L$
   d) None of these.

1(xi) When a source is delivering max power to a load, the efficiency of the   1   CO1
circuit
   a) is always 50%
   b) is always 75%
   c) Depends on the circuit parameter
   d) None of these

1(xii) A cut-set schedule gives the relation between   1   CO5
   a) Branch current and link current
   b) Branch voltage and tree branch voltage
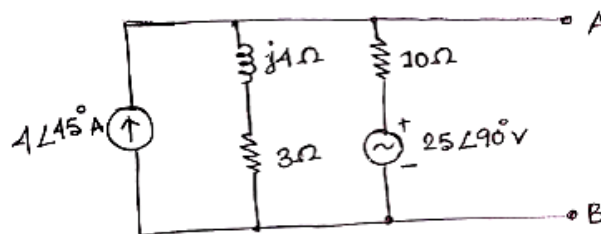   c) Branch voltage and link voltage
   d) Branch and tree current
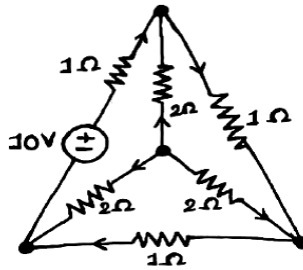
GROUP – B
(Short Answer Type Questions)
(Answer any *three* of the following)   **3 x 5 = 15**

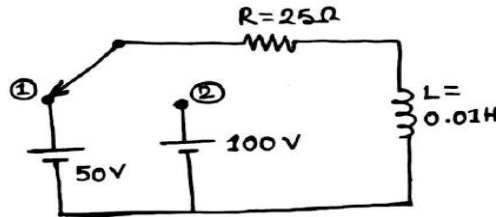|		**Marks**	**CO No**

2   Find Norton's equivalent network across terminal A and B   5   CO1
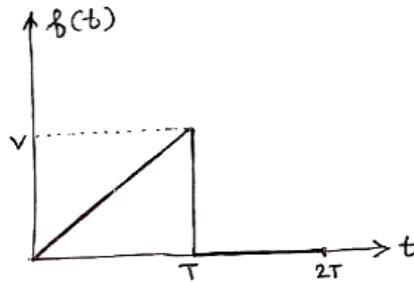

3   With reference to the figure draw the oriented graph and write down   5   CO5
the Tie Set matrix.

| 4 | The circuit in the figure was in steady state with switch in position 1. Find current i(t) for t > 0 if the switch is moved from position 1 to 2 at t = 0. | 5 | CO2 |

| 6 | Find the laplace transform of the waveform shown in figure. | 5 | CO3 |

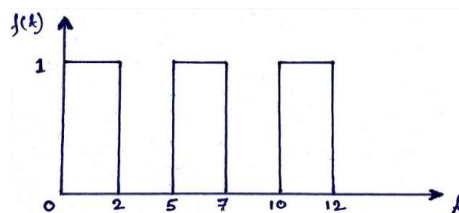| 6 | What are ABCD parameters? Prove that AD − BC = 1 | 5 | CO4 |

GROUP – C
**(Long Answer Type Questions)**
(Answer any *three* of the following)   **3 x 15 = 45**

| | | **Marks** | **CO No** |
| 7.a) | Find the Laplace transform of the periodic function shown in figure below: | 5 | CO3 |

| 7.b) | For an RL series circuit shown in figure, with no initial current in the inductor, a voltage $V = 4e^{-t}$ volts is applied at t = 0 sec. find the expression for the resulting current in the circuit for $t \geq 0$ using laplace transform method. | 5 | CO2 |
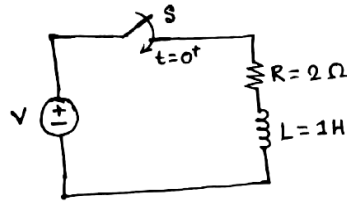
7.c)	Find the inverse Laplace transform of $F(s) = \dfrac{s^2 - 15s - 11}{(s+1)(s-2)^2}$	5	CO2
8.a)	Find Z-parameters in terms of Y-parameters of a two port network.	5	CO4
8.b)	Deduce the condition for reciprocity and symmetry for the Z parameter of a two port network.	5	CO4
8.c)	Find Y parameters for the network. Determine whether the network is symmetrical and reciprocal.	5	CO4
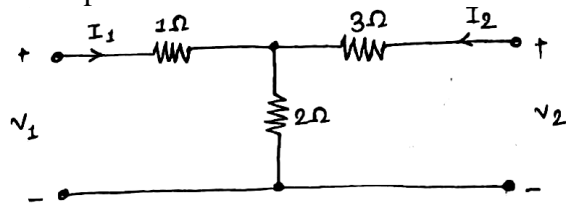
9.a)	State and explain Thevenin's theorem.	6	CO1
9.b)	Find the current through $(3 + j4)$ Ω impedance using Superposition theorem.	9	CO1
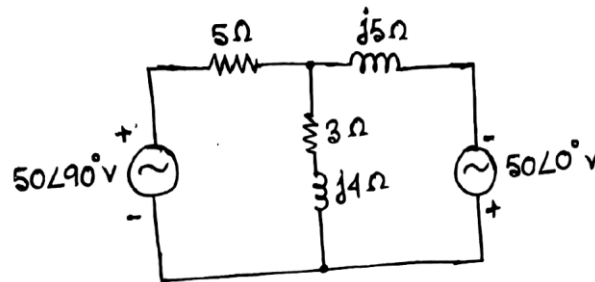
10.a)	Design a first-order low pass filter with a cut-off frequency of 2 kHz and pass-band gain of 3.	7	CO3
10.b)	What are the advantages of active filter over passive filter?	3	CO3
10.c)	Draw and explain the characteristics of an ideal band-pass filter.	5	CO3
11.a)	What is oriented graph of a network? Explain with a suitable example.	6	CO5
11.b)	For the network shown in figure below write down the Tie set matrix and obtain the network equilibrium equation in matrix form using KVL. Calculate loop currents.	9	CO5