GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

CIRCUIT THEORY AND NETWORK(Backlog)

EE(CSE)301

TIME ALLOTTED: 3 Hours **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

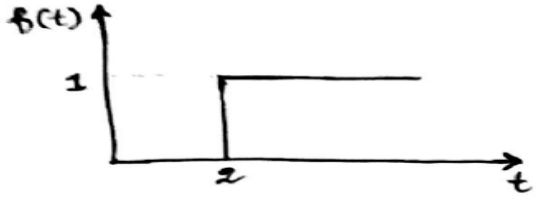
(Multiple Choice Type Questions)

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

		Marks	CO No
1(i)	The node method of circuit analysis is based on a) KVL and Ohm's law b) KCL and KVL c) KVL, KCL and Ohm's law d) KCL and Ohm's law	01	**CO**1
1(ii)	Maximum power transfer occurs at efficiency of a) 100% b) 50% c) 25% d) 75%	01	**CO** 2
1(iii)	What should be the internal impedance of an ideal current source? a) zero b) infinite c) both (a) & (b) d) none of these	01	**CO** 4
1(iv)	The phasor combination of resistive power and reactive power is a) active power b) apparent power c) average power d) none of these	01	**CO**1
1(v)	A series resonance circuit under resonance condition is called a) an oscillator circuit b) a rejector circuit c) an acceptor circuit d) none of these	01	**CO**1
1(vi)	The value of the impulse function $\delta(t)$ at $t=0$ is a) 0 b) ∞ c) 1 d) indeterminate	01	**CO**2
1(vii)	A two port network is reciprocal if and only if a) $Z_{11} = Z_{22}$ b) BC - AD = -1 c) $Y_{12} = Y_{21}$ d) both b) and c)	01	**CO**4

1(viii) Laplace Transform analysis gives — 01 — **CO**2
- a) timedomain response only
- b) frequency domain response only
- c) real response only
- d) Both (a) & (b)

1(ix) The function f(t) in figure below — 01 — **CO**3
- a) u (t)
- b) u(t – 2)
- c) u(2 – t)
- d) u(2t)



1(x) An R-C series circuit has a time constant given by — 01 — **CO**1
- a) R/C
- b) C/R
- c) 1/RC
- d) RC

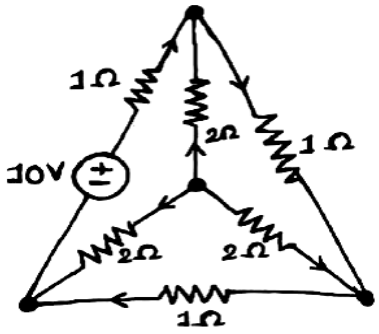
1(xi) The Cut-set matrix gives the relation between — 01 — **CO**5
- a) branch currents and link currents
- b) branch voltages and twig voltages.
- c) branch voltages and link voltages
- d) none of these

1(xii) The number of links for a graph having ‘n’ nodes and ‘b’ branches — 01 — **CO**5
- a) b – n + 1
- b) n – b + 1
- c) b + n – 1
- d) b + n

GROUP – B
(Short Answer Type Questions)

(Answer any *three* of the following) **3 x 5 = 15**

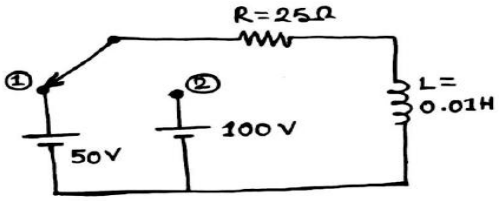
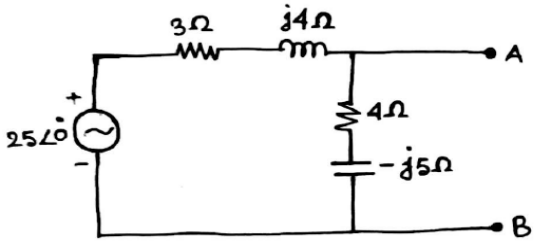
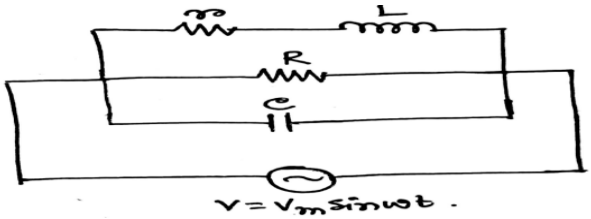
		Marks	CO No
2	State and prove Maximum Power Transfer theorem For AC network.	5	CO1
3	With reference to the figure draw the oriented graph and write down the Tie Set matrix.	5	CO5



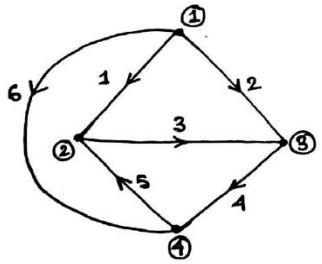
4	What is impulse function? Find its Laplace Transform.	5	CO2
5	The combined inductance of two coils connected in series is 0.6H or 0.1H depending on relative directions of currents in the two coils. If one of the coils has a self-inductance of 0.2H, find (i) mutual inductance and (ii) coefficient of coupling.	5	CO5
6	Determine Y- parameter in terms of Z- parameter	5	5

GROUP – C
(Long Answer Type Questions)

(Answer any *three* of the following) **3 x 15 = 45**

		Marks	CO No
7.a)	Find the inverse Laplace of F (s). $F(s) = \frac{10(s+4)}{s(s+3)(s+1)^2}$	7	CO2
7.b)	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. 	8	CO2
8.a)	State and explain Norton's theorem.	6	CO1
b)	Obtain Norton's equivalent network between terminal A and B as shown in fig. 	9	CO1
4.a)	Derive the expression for resonant frequency for the parallel circuit shown in figure. 	9	CO5

b)	For the oriented graph shown below find the incidence matrix and reduced incidence matrix and reduced incidence matrix. Find the possible number of trees.	6	CO5



5	An RLC series circuit with a resistance 10Ω, inductance of 0.2H and a capacitance of 40μF is supplied with a 100V supply at variable frequency. Find the following w.r.t. the series resonant circuit. (i) Frequency of which resonance takes place (ii) Current (iii) Power (iv) Power factor (v) Voltage across R, L, C at that time (vi) Quality factor (vii) Half power points (viii) Resonance curve (ix) Phasor diagram	15	CO5