GURU NANAK INSTITUTE OF TECHNOLOGY
An Autonomous Institute under MAKAUT
2020-2021
CIRCUIT THEORY & NETWORKS
## EI303
TIME ALLOTTED: 3 HoursFULL 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) Two resistors are connected in parallel & each dissipates 20 watts. **01** **CO 1**
The total power dissipated across two resistors equals
a) 10 watts
b) 20 watts
c) 40 watts
d) 80 watts

1(ii) Superposition theorem is not valid for **01** **CO 1**
 a) voltage responses
 b) current responses
 c) power responses
 d) either a) or b)

1(iii) The Laplace transform of the signal described in the figure -1 shown **01** **CO 2**
below is
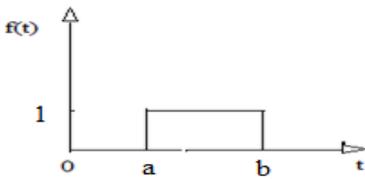
a) e^{-as}/s
b) e^{-bs}/s
c) $(e^{-as} + e^{-bs})/s$
d) $(e^{-as} - e^{-bs})/s$

1(iv) Find the conductance of a conductor of resistance 10 Ω and, 5 kΩ. **01**
(a) 0.01S and 0.02mS
(b) 0.1S and 0.02mS
(c) 0.01S and 0.2mS
(d) 0.1S and 0.2mS

1(v) The value of impulse function $K\,\partial(t)$ at $t = 0$ is **01** **CO 2**
a) K
b) 0
c) ∞

d) 1

1(vi)	Thevenein's equivalent resistance of the given circuit is a) 20 Ω b) 0 Ω c) 5 Ω d) 10 Ω	01	CO 1
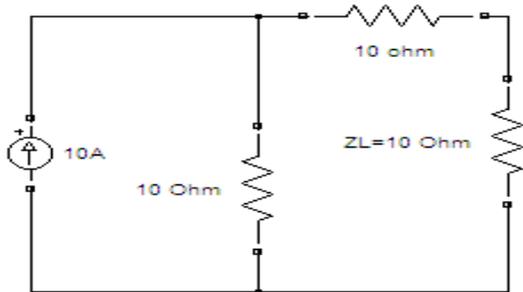
1(vii)	In a R-L series circuit, the phase angle difference between voltage and current is a) 30° b) 90° c) 180° d) in between 0° & 90°	01	CO 1
1(viii)	Impulse function is first derivative of a) ramp function b) Step function c) gate function d) parabolic function	01	CO 2
1(ix)	In Superposition theorem, while considering a source, all other current sources are? a) short circuited b) change its position c) open circuited d) removed from the circuit	01	CO 1
1(x)	At resonance the impedance of the circuit given is a) 100 Ω b) 50 Ω c) 120 Ω d) 10 Ω	01	CO 3
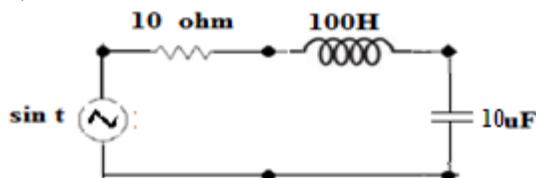
|			
1(xi)	For a series resonant circuit at low frequency, circuit impedance is _____ and at high frequency circuit impedance is _____ a) capacitive, inductive b) inductive, capacitive c) resistive, inductive d) capacitive, resistive	01	CO3
1(xii)	A filter that passes frequencies between two designated cut-off frequencies and attenuates all other frequencies is called? a) high pass filter b) band elimination filter c) band pass filter d) low pass filter	01	CO 5

GROUP – B
(Short Answer Type Questions)
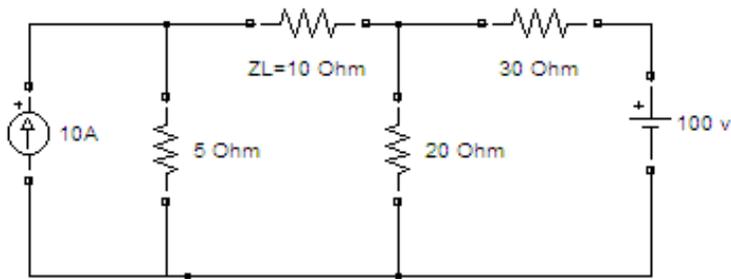(Answer any *three* of the following)   3 x 5 = 15

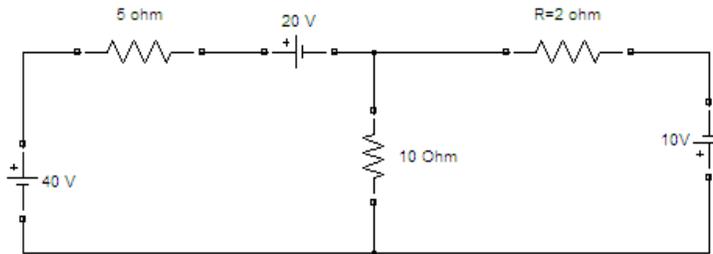|		Marks	CO No
2.	Define ABCD parameters of a two port network. Where are they most efficiently used?	5	CO4
3.	Find the voltage across the Resistance R of the circuit shown.	5	CO1
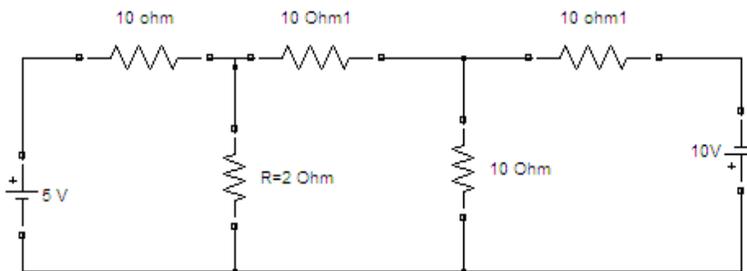
		Marks	CO No
4.	Determine the Laplace Transform of the given signal	5	CO2
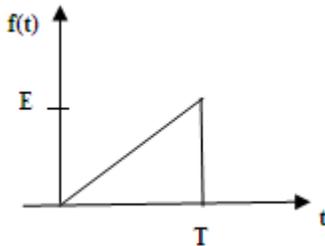
|		Marks	CO No
5.	Draw equivalent circuit by applying Thevenin's Theorem and find out load current.	5	CO1

6.   State Superposition Theorem. Using this theorem calculate the current   5   CO1
through R of the circuit, shown in the figure below.
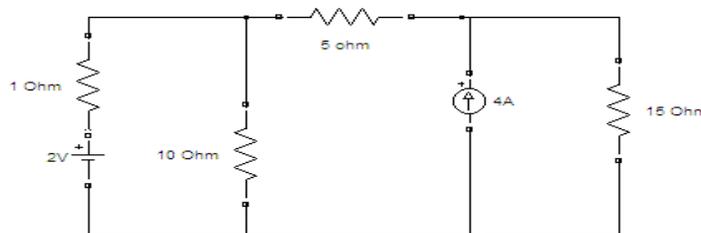

GROUP – C
(Long Answer Type Questions)
(Answer any *three* of the following)   3 x 15 = 45

	Marks	**CO No**
7. a) Find out the node voltages using super node analysis.	5	CO1
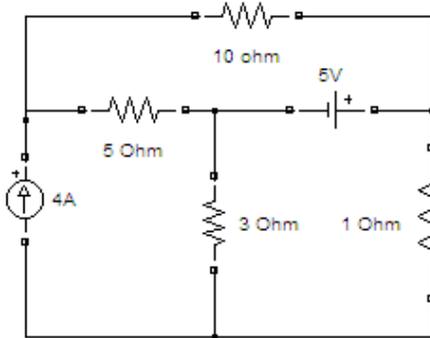
7. b)   Find the current through 10 Ohm resistor using Norton's theorem   5   CO1

7. c)	Find the voltage across R	5	CO1
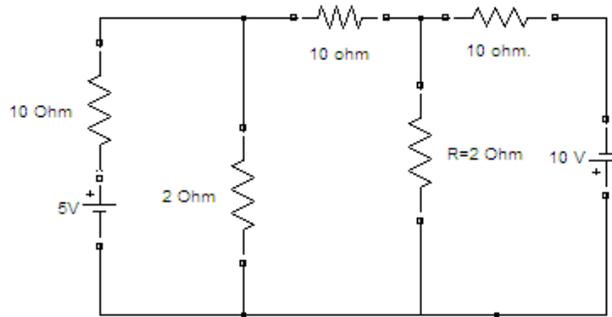
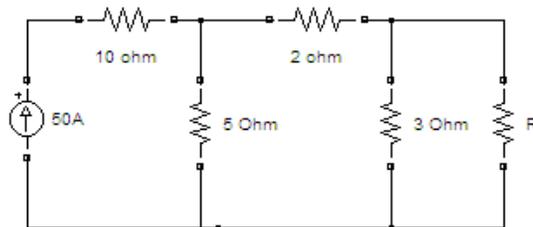|			
8.a)	State andprove Maximum Power Transfer theorem.Show that the efficiency for maximum power transfer is 50%.	4	CO1
8.b)	What should be the value of impedance R for maximum power to be transferred from the source. Obtain the amount of maximum power.	5	CO1

|			
8.c)	A coil of inductance 50 mH and resistance 5Ω is connected to a 110 V d.c. supply. Determine (a) the final value of current, (b) the value of current after 4 ms, (c) the value of the voltage across the resistor after 6 ms, (d) the value of the voltage across the inductance after 6 ms, and (e) the time when the current reaches 15 A.	6	CO1
9.a)	The circuit shown in the figure is initially at steady state with switch at position 'a'. If the switch position is changed from 'a' to 'b' at time t=0, find the expression for current after switchi	5	CO2
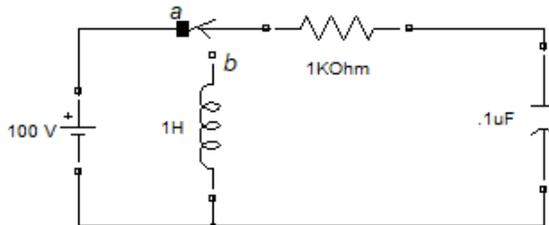
|			
9.b)	Find the transient response of aR-C series circuit due to step input signal.	5	CO2
9.c)	Design a band pass filter with f_L=200 Hz &f_H= 1 KHz and a pass band gain=4. Also calculate Q of the filter.	5	CO5
10. a)	What are Symmetry and Reciprocityin terms of a two port network.Determine, for a two port network, the condition of reciprocity and condition of symmetry in terms of Y parameter.	6	CO4

10. b)	What are the open circuit impedance parameters of a two port network? Why are they so called?	5	CO4
10. c)	Define Tree and Co-Tree. Write the Incidence matrix of the given oriented graph.	4	CO4
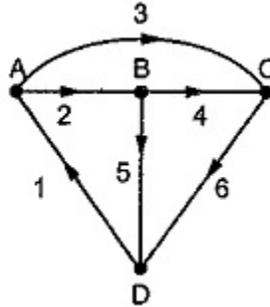
11.a)	Write down the tie set matrix for the following circuit given. Also find branch current in terms of loop current.	6	CO5
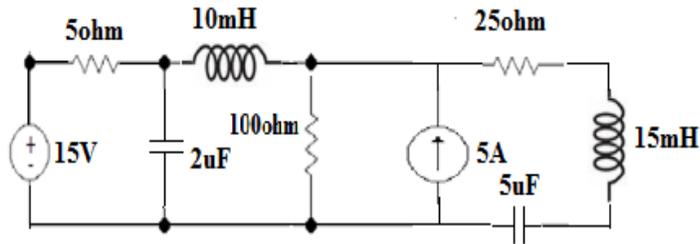
11.b)	What is selectivity of a resonant circuit? Prove that the selectivity is the quality factor.	4	CO3
11.c)	a) Prove that resonance frequency $f_0 = 1/2\pi\sqrt{LC}$ for a R-L-C series network. b) For a R-L-C network, prove bandwidth is the ratio of resonance frequency to the quality factor	5	CO3