**1 (Sem–3/FYUGP) ECT41MN/(B)**

**2025**

# ELECTRONICS AND COMMUNICATION TECHNOLOGY

( Minor )

Paper : ECT4300104 MN

**(SET–B)**

***( Network Analysis )***

*Full Marks : 45*

Time : 2 hours

***The figures in the margin indicate full marks for the questions.***

1. State True ***or*** False : 1×5=5

   *(a)* Nodal Analysis is mainly based on *KCL*.

   *(b)* Norton's theorem is converse of Thevenin's theorem.

   *(c)* The algebric sum of currents entering a node must be equal to the algebric sum of the currents leaving a node.

(d) Derive an expression of current for Step Response of *R-C* circuit using Laplace transform.

(e) Find out the Laplace transform of Unit-Step function.

(f) Define transfer function. Consider a two-port network and write down its driving point impedances and admittances.

(g) Draw a low-pass filter with *RC* circuits. What is the value of its cut-off frequency $f_c$? If $R = 550\Omega$ and $f_c = 400Hz$, what is the value of $C$?

(h) Determine the *Y*-parameters of the networks shown in *Fig.* 2.

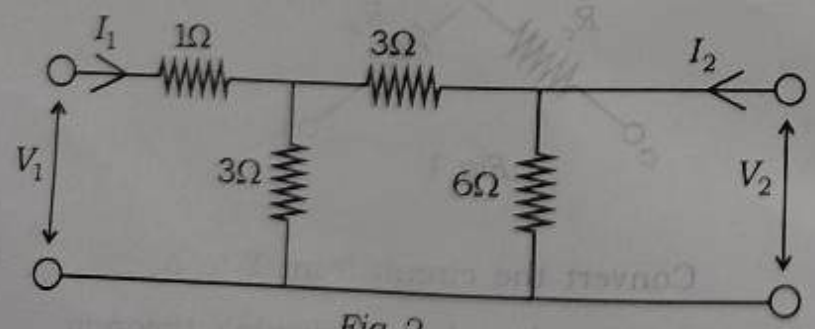


*Fig.* 2



4. Answer the following questions : ***(any one)*** 10×1=10

(a) Use the Superposition theorem to determine the current through the resistance $R = 4\Omega$ for the network of *Fig.* 3.

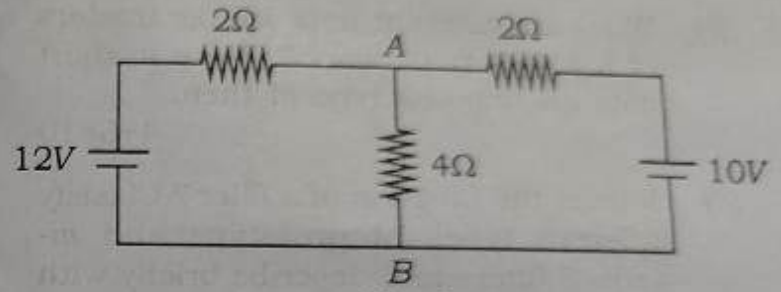


*Fig.* 3

Apply Thevenin's theorem to find the current through the resistance *R* and the voltage across if of the circuit of *Fig.* 4. 5+5=10

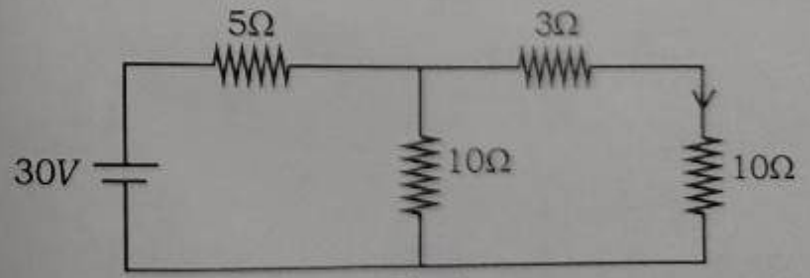


*Fig.* 4

(d) *Any two* terminal bilateral linear d.c. circuit can be replaced by an equivalent circuit consisting of a voltage source and a series resistor.

(e) A filter is an electrical network that can not transmit signals within a specified range.

2. Answer the following questions : ***(any five)*** 2×5=10

(a) What are poles and zeros of a network function ?

(b) Mention *any two* properties of Laplace Transform.

(c) State Norton's theorem.

(d) State Superposition theorem.

(e) Classify the filters depending on their frequency characteristics.

(f) What are open and short circuits ?

(g) Define ramp function.

(h) What is a *T*-section network ?

(i) Draw a high-pass prototype filter (both *T*-section and $\pi$-section).



(j) Draw a *m*-derived *T*-section filter from its prototype.

3. Answer the following questions : ***(any four)*** 5×4=20

(a) Define the following terms :

(i) Branch

(ii) Node

(iii) Loop

(iv) Tree

(v) Twigs

(b)

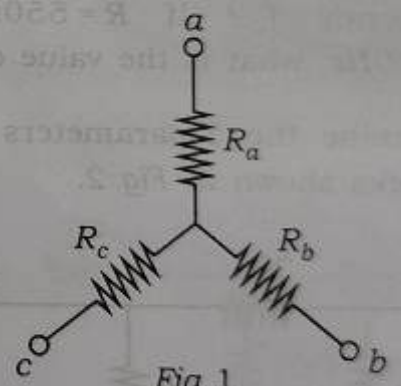


Fig. 1

Convert the circuit from *Y* to $\Delta$.

(c) State and explain Thevenin's theorem.

(b) State and prove the convolution property of Laplace transform. Find the Laplace transform of ramp function. What are driving point impedance and transfer impedance of a network?

5+3+2=10

(c) What are different network parameters of a two-port network? Write a short note on *any one* type of them.

4+6=10

(d) What is the function of a filter? Classify different types of prototype and *m*-derived filters and describe briefly with proper diagrams.

2+8=10