QP Code: S253A047 Reg. No | | | | | | | | | | AY 23

Gandhi Institute of Engineering and Technology University, Odisha, Gunupur (GIET University)

B. Tech (Third Semester – Regular & Supplementary) Examinations, November 2025

23BELPC23002/23BEEPC23002 – Network Theory

(EE/EEE)

Time: 3 hrs Maximum: 60 Marks

Answer ALL questions

(The figures in the right hand margin indicate marks)

PART – A **(2 x 5 = 10 Marks)**

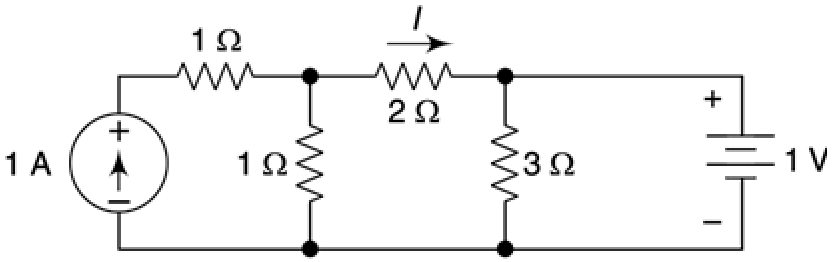
Q.1. Answer ***ALL*** questions

	Question	CO #	Blooms Level
a.	List the applications of the Maximum Power Transfer Theorem in electrical and communication systems..	CO1	K2
b.	A parallel RLC circuit has R=20KΩ, L=10mH and C=1μF. Compute its resonant frequency and Q.	CO2	K2
c.	For a two-port network with z-parameters: z11 = 40Ω, z22 = 50Ω and z12 = z21 = 20Ω, determine the corresponding Y-parameter.	CO3	K3
d.	Find Inverse Laplace transform of function $F(s) = \frac{1}{(s+1)(s+3)}$.	CO4	K2
e.	Using the Hurwitz criterion, determine whether the polynomial $D(s) = S^2 + 3S + 2$ satisfies the stability condition.	CO5	K3

PART – B **(10 x 5 = 50 Marks)**

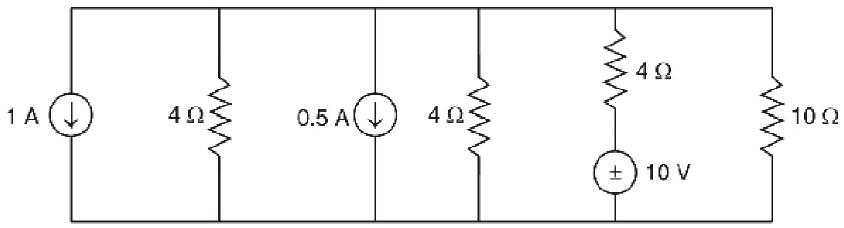
<u>Answer ***ALL*** the questions</u>

	Question	Marks	CO #	Blooms Level
2. a.	Discuss how efficiency and maximum power transfer are conflicting design goals in electrical systems.	5	CO1	K2
b.	Find current I in the circuit shown in figure using superposition theorem.	5	CO1	K3



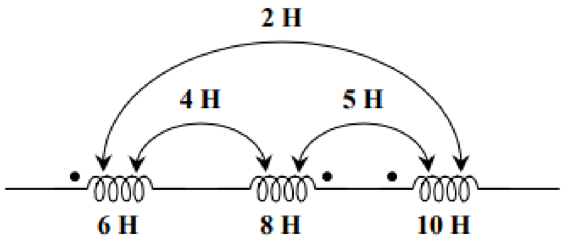
(OR)

	Question	Marks	CO #	Blooms Level
c.	Calculate the current through 10Ω and voltage drop across it for the circuit shown in fig by using Millman's Theorem.	5	CO1	K2



	Question	Marks	CO #	Blooms Level
d.	Apply the Reciprocity Theorem to the circuit containing a voltage source and two resistors, and verify that the current and voltage interchange gives the same ratio.	5	CO1	K3
3.a.	Derive the condition for resonance in a series RLC circuit and show that the impedance is minimum at this condition.	5	CO2	K3

b. For the three coupled coils shown in figure. Calculate the total inductance. — 5 CO2 K2



(OR)

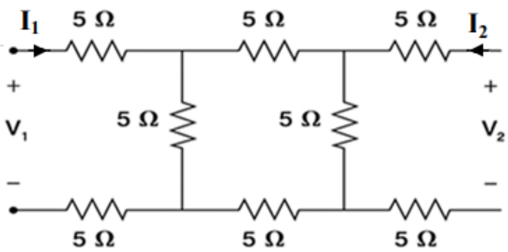
c. A parallel RLC circuit consists of R=200Ω, L=0.1H, C=25μF. Calculate: — 5 CO2 K3

I. Resonant frequency
II. Q-factor
III. Bandwidth

d. Two coils connected have self-inductance L1=4H and L2=9H. coefficient of coupling between them k=0.5 — 5 CO2 K2

a) Find the mutual inductance (M).
b) Determine the total inductance when the coils are connected in series aiding and series opposing.

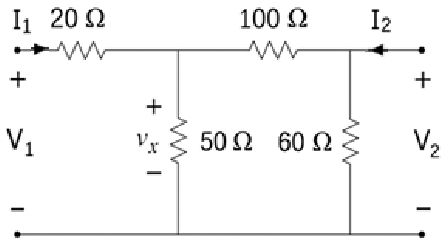
4.a. Starting from the given two-port (all resistors = 5Ω), evaluate whether the network is reciprocal and symmetric by computing Z-parameters. — 5 CO3 K3



b. For a 2-port network express Z parameter in terms of Y Parameter — 5 CO3 K2

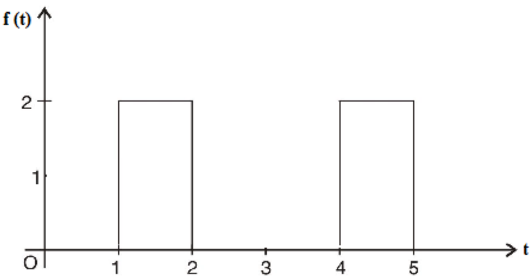
(OR)

c. Two-port network shown below, determine the hybrid parameters. Analyse whether the network is reciprocal and symmetric, based on the calculated parameters. — 5 CO3 K3



d. Given a two-port network with z11=1KΩ, z22=800Ω, z12=200Ω and z21=200Ω, determine the input impedance (Zin) when load resistance R_L =1KΩ. — 5 CO3 K3

5.a. Compute the Laplace transform of the waveform shown in figure. — 5 CO4 K3



b. Given $F(s) = \frac{2(S+1)}{S(S+2)(S+4)}$. — 5 CO4 K2

Determine the initial and final values by using Initial & Final value theorem.

(OR)

c. Using the partial fraction method, determine the time-domain expression I(t) corresponding to the Laplace-domain function. — 5 CO4 K3

$$I(S) = \frac{4S}{(S+2)(S+4)}$$

Show all steps of your calculation.

d.	State the restrictions on poles and zeros of a driving-point impedance function.	5	CO4	K1
6.a.	For the function F(s) $$F(s) = \frac{s^2 + 2s + 10}{s + 10}$$ Check whether the function satisfies all conditions of a Positive Real (PR) function. Comment on which condition (if any) is violated.	5	CO5	K2
b.	Using continued fraction expansion, obtain the Cauer-II form realization of the impedance function. $$F(s) = \frac{s^4 + 4s^2 + 3}{2s^3 + 3s}$$	5	CO5	K3
	(OR)			
c.	Apply the Hurwitz criterion to determine whether the given network function is stable or not. $\mathrm{F}(s) = s^4 + 3s^3 + 5s^2 + 7s + 6$, Justify your answer.	5	CO5	K4
d.	For the function given below: $$Z(s) = \frac{8s^5 + 5s^3 + 3s}{s^4 + 3s^2 + 1}$$ Determine the terms of the continued fraction expansion using the Cauer-I method.	5	CO5	K2

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