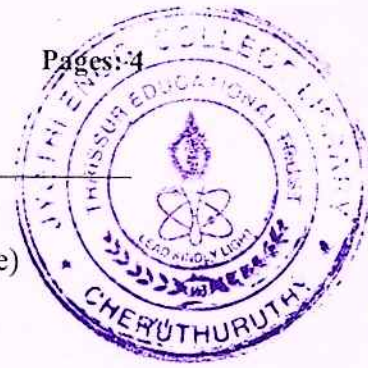


Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
B.Tech Degree S3 (S) Examinations (FT/WP) May 2026 (2024 Scheme)



Course Code: PCEET302

Course Name: CIRCUITS & NETWORKS

Max. Marks: 60

Duration: 2 hours 30 minutes

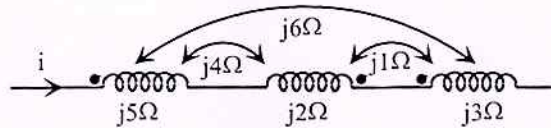
PART A

(Answer all questions. Each question carries 3 marks)

- | | | CO | Marks |
|---|--|-----|-------|
| 1 | Replace the circuit shown below with a single voltage source in series with a resistance between the terminals A and B. | CO1 | (3) |
| | | | |
| 2 | Determine the Thevenin equivalent circuit between the terminals A and B in the network shown below. Also determine the maximum power that can be transferred to a load R_L connected between the terminals A and B. | CO1 | (3) |
| | | | |
| 3 | A series RLC circuit with $R = 10\Omega$, $L = 2H$ and $C = 0.5F$ is connected to a 230V, variable frequency AC source. Determine the frequency (in Hz) of the source at which the circuit current is maximum. Also find the maximum current. | CO3 | (3) |
| 4 | Explain the concept of neutral shift in three phase 3-wire systems. Also, write an expression for neutral shift voltage. | CO4 | (3) |
| 5 | Derive the s-domain equivalent of an inductor having an initial current of I_0 | CO2 | (3) |
| 6 | A resistor R and an initially relaxed capacitor of $1F$ are connected in series across a 10V DC supply. Calculate the value of R such that the voltage | CO2 | (3) |

across the capacitor becomes 6.3212V in 1 second after the circuit is switched ON.

- 7 Determine the T-parameters of a two-port network described by the equations $V_1 = 4I_1 + 2I_2$ and $V_2 = I_1 + 6I_2$. CO5 (3)
- 8 Determine the equivalent inductive reactance of the following coupled network. CO6 (3)

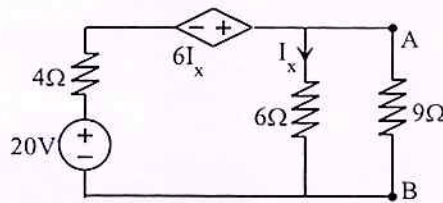


PART B

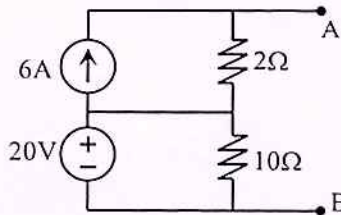
(Answer any one full question from each module, each question carries 9 marks)

Module -1

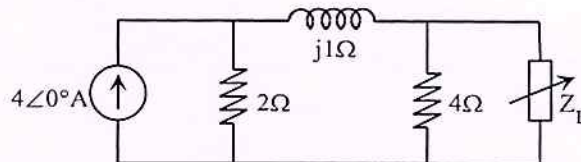
- 9 a) For the circuit shown below, find current I_L through 9Ω using Thevenin's theorem. CO1 (5)



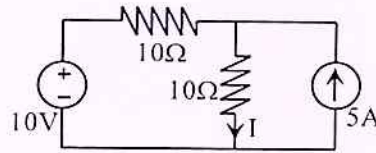
- b) Determine Norton's equivalent circuit across the terminals A and B in the circuit shown below. CO1 (4)



- 10 a) Determine the load Z_L (complex load) required to be connected in the circuit shown in the figure below for maximum power transfer. Also, find the maximum power. CO1 (6)



- b) Find current I in the circuit shown in the figure below using superposition theorem. CO1 (3)

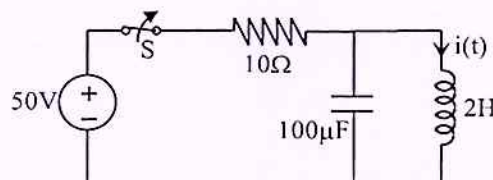


Module -2

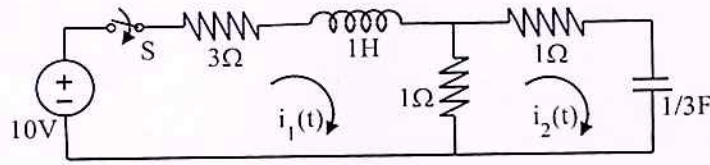
- 11 a) Determine the current through the neutral wire in a 3-phase 4 wire star connected system, if the phase currents of the load are $I_R = 20\angle -30^\circ A$, $I_Y = 10\angle -50^\circ A$ and $I_B = 8\angle 45^\circ A$. CO4 (3)
- b) A resistor, a capacitor and an inductor are connected in series with a 230 V, variable frequency AC source. When the supply frequency is varied to 25Hz, the circuit offered a minimum impedance of 50Ω . If the inductance of the circuit is $1H$, determine the following;
 (i) Resistance and capacitance of the circuit. (ii) The voltage across the capacitor. (iii) Q factor at resonance and bandwidth of the circuit. (iv) Half power frequencies CO3 (6)
- 12 a) Derive the expression for resonant frequency (in Hz) of a series RLC circuit. Also draw the impedance Vs frequency characteristics marking the leading and lagging power factor regions. CO3 (3)
- b) A 400V, three-phase balanced supply feeds a delta-connected load having phase impedances $Z_{ab} = 10\angle 45^\circ \Omega$; $Z_{bc} = 20\angle 0^\circ \Omega$; and $Z_{ca} = 16\angle -30^\circ \Omega$. Determine (i) phase currents (ii) line currents (iii) total active power and iv) total reactive power. Assume abc phase sequence. CO4 (6)

Module -3

- 13 a) The current through a $4F$ capacitance is given by the following s-domain equation. $I(s) = \frac{24(s+2)}{(s+1)(s+3)}$. Find voltage across the capacitance $v(t)$. Also find the value of voltage under steady-state condition. CO2 (4)
- b) The switch S in the circuit shown in figure is closed for a long time till the steady state is reached. At $t=0$, the switch is opened. Find an expression for current through the inductor for $t > 0$. CO2 (5)



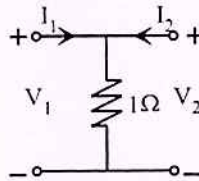
- 14 a) In the network given below, the inductor and capacitor are initially relaxed. CO2 (6)
 The switch S is closed at time $t = 0$. a) Model the circuit in s-domain for $t > 0$ b) Using mesh analysis, determine the expression for the current through the inductor for $t > 0$.



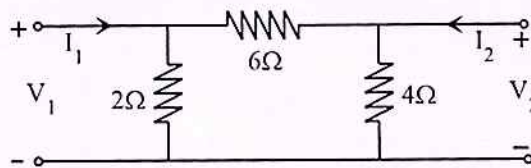
- b) A capacitor of $0.5F$ initially charged to $1V$ is connected in series with a resistance 2Ω and initially relaxed inductance $1H$ at $t = 0$. Determine the current $i(t)$ for $t > 0$. CO2 (3)

Module -4

- 15 a) For the network shown in figure below, determine Z parameters and hence find the h-parameters. Also check whether the network is symmetrical. CO5 (3)



- b) Two identical networks as shown in figure below are connected in parallel. Find Y parameters of the resultant combination. Is the combined network reciprocal? CO5 (6)



- 16 a) Show that the transmission parameters of two cascaded two-port networks is the product of the transmission parameter matrices of individual two-port networks. CO5 (4)

- b) For the network shown below. find the voltage across 10Ω resistance. CO6 (5)

