Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S3 (S,FE) (FT/WP) (S1 PT) Examination May 2025 (2019 Scheme)

Course Code: EET201

Course Name: CIRCUITS AND NETWORKS

Max. Marks: 100 Duration: 3 Hours

PART A

Answer all questions. Each question carries 3 marks Marks

1 State Thevenin's theorem. Draw and explain the Thevenin's equivalent circuit. (3)

2 State maximum power transfer theorem for ac circuits. Derive the condition for maximum power transfer from the source to load. (3)

3 What do you mean by (*i*) damping ratio (*ii*) natural and forced response? (3)

4 Consider a constant voltage E volts is applied to a series RC circuit (zero initial conditions) at time, $t = 0$. Find an expression for the transient current $i(t)$ using Laplace transform method. (3)

5 Derive the *s*-domain equivalent circuit of a capacitor holding an initial voltage of V_0 volts. (3)

6 Compute the equivalent reactance of the three coupled coils shown below across the terminals A and B. (Ref. Fig.1). (3)

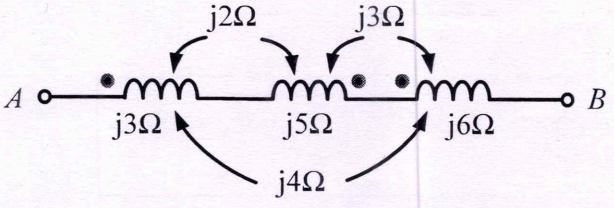


Fig.1.

7 With neat sketches describe the variation of phase angle as a function of frequency in a series RLC resonant circuit. (3)

8 RLC series resonant circuit acts as an acceptor circuit. Why? (3)

9 Explain the series connection of two, two-port networks. (3)

10 For the circuit shown (Ref. Fig.2), check the condition for reciprocity in terms of hybrid parameters. (3)

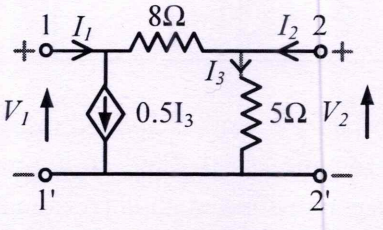


Fig. 2.

PART B

Answer any one full question from each module. Each question carries 14 marks

Module 1

11 For the circuit shown below (Ref. Fig.3) the load terminals are A and B. Determine (*i*) Norton's equivalent circuit (*ii*) Load impedance to achieve maximum power transfer from the source to load and (*iii*) Maximum power transferred from the source to load. (14)

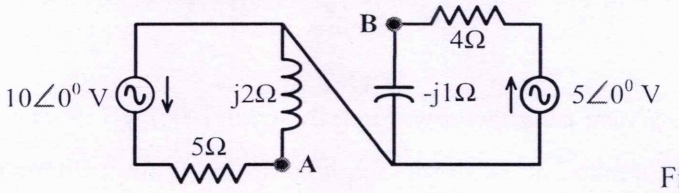


Fig. 3.

12 What do you mean by superposition theorem? Using this theorem, determine the voltage V_0 and current I_0 in the circuit shown below (Ref. Fig.4). (14)

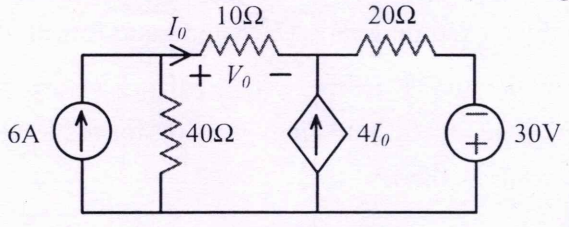


Fig.4.

Module 2

13 In the circuit shown (Ref. Fig.5), the switch is closed at time, $t = 0$. Find the transient current and the initial rate of change of current. The initial conditions are marked as shown. $Q_0 = 30$ coulombs. (14)

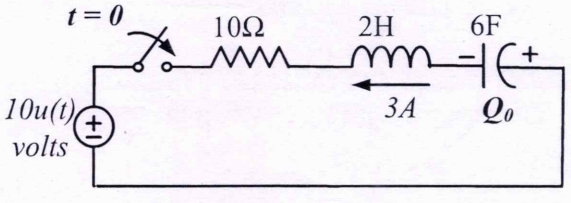


Fig.5.

14 A. In the circuit shown below (Ref. Fig.6), the switch is initially put in position 1 for 2μs and then put in position 2. Find the voltage across the capacitor plates before moving the switch to position 2. (7)

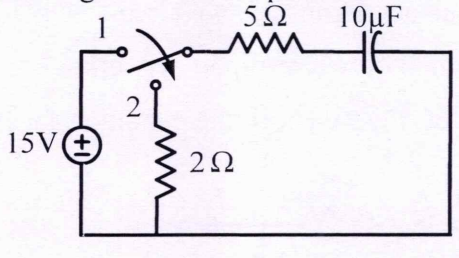


Fig. 6.

B. Consider a voltage of $50\sin 25t$ volts is applied to a series RL circuit with $R = 10\Omega$ and $L = 5H$ at time, $t = 0$. Find an expression for the transient current $i(t)$ using Laplace transform method (Assume zero initial state). (7)

Module 3

15 A. Obtain the pole-zero plot for the network function: $N(s)=\dfrac{s(s+3)}{(s+1)(s^2+25)}$. (6)

B. For the circuit shown below (Ref. Fig.7), find the voltage across 5Ω resistor. (8)

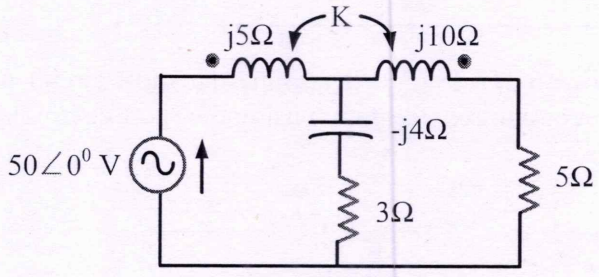


Fig.7.

16 In the circuit shown below (Ref. Fig.8), the switch is closed at time, $t=0$. Find the transient currents $i_1(t)$ and $i_2(t)$ in the meshes 1 and 2 respectively using mesh current analysis. Assume zero initial conditions. (14)

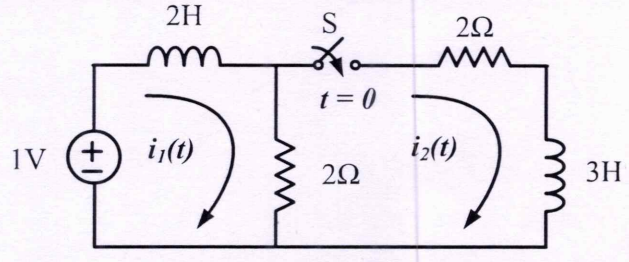


Fig. 8.

Module 4

17 A. Derive an expression for resonant frequency and quality factor of a series RLC resonant circuit. (4)

B. Calculate the impedance of a series *RLC* circuit, at the frequency of 10kHz below the resonant frequency of 1.5MHz. The *Q*-factor is 80 and the capacitance is 300pF. Also calculate the band width and the half power frequencies. (10)

18 A. What do you mean by neutral shift voltage? Where it occurs? (4)

B. 3-phase, 3-wire, 208V, 50Hz supply with ABC phase sequence is applied to a star connected load. (10)

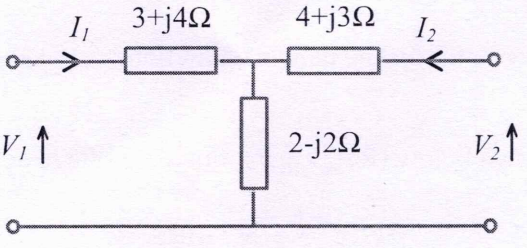
$Z_A=10\angle 0^0\Omega,\ Z_B=15\angle 30^0\Omega,\ Z_C=10\angle -30^0\Omega$

Determine the phase currents, line currents, voltage across each impedances and neutral displacement voltage.

Module 5

19 A. Explain the conversion of Z parameters to T parameters? (6)

B. For the circuit shown (Ref. Fig.9) determine the T-parameters.



(8)

Fig.9.

20 For the circuit shown (Ref. Fig.10) determine the short circuit parameters and draw the equivalent circuit representation using the short circuit parameters. (14)

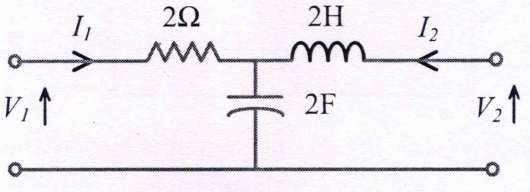


Fig.10.

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