VIT

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

CHENNAI

24BLG1058

Final Assessment Test(FAT) - Apr/May 2025

Programme	B.Tech.	Semester	Winter Semester 2024-25
Course Code	BECE203L	Faculty Name	Prof. Sivasubramanian A
Course Title	Circuit Theory	Slot	D1+TD1+TDD1
		Class Nbr	CH2024250502882
Time	3 hours	Max. Marks	100

Instructions To Candidates

- Write only your registration number in the designated box on the question paper. Writing anything elsewhere on the question paper will be considered a violation.

Course Outcomes

CO1: Apply the knowledge of various circuit analysis techniques such as mesh analysis, nodal analysis, and network theorems to investigate the given network.
CO2: Analyse the resonance and transient response of the first order, second order circuits
CO3: Able to solve the networks using graphical approach.
CO4: Design and analyse two-port networks, passive filters and attenuators.
CO5: Able to analyse the given network by transforming from time domain to S domain.
CO6: Analyse the given network using Fourier series and transforming from time domain to frequency domain.

Section - I

Answer all Questions (6 × 15 Marks)

01. (a) Determine the value of I_0 in the circuit of Fig.1 using nodal analysis. **[8 Marks]**

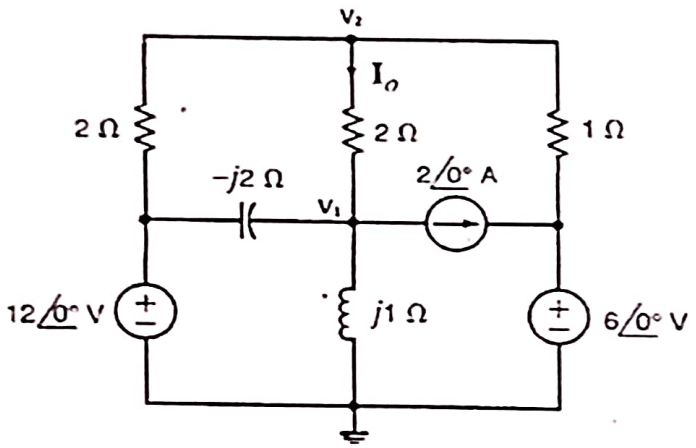

Fig.1

(b) Use superposition theorem and find V_0 in the network of Fig.2. **[7 Marks]**

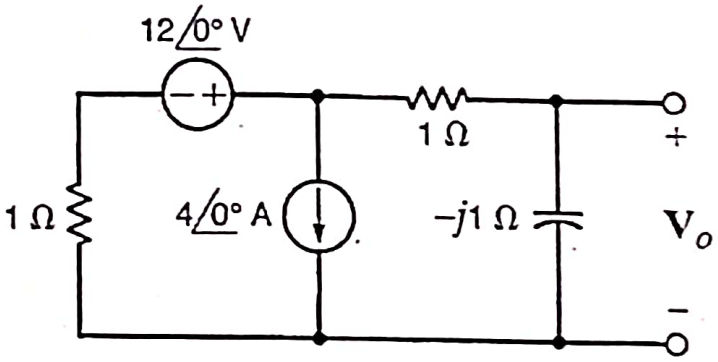

Fig.2

[15] (CO1/K3)

02. (a) Consider the switch in the circuit of Fig.3 has been in position 1 for a long time, and at time $t = 0$ the switch is moved to position 2. Determine the voltage across the capacitor for $t > 0$. **[6 Marks]**

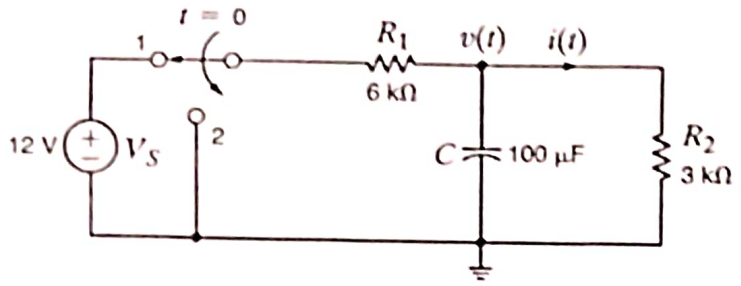

Fig.3

(b) Consider a parallel RLC circuit with R = 2 Ω, L = 1 H, and C = 10 mF. Find the voltage response v(t), across the capacitor, for $t > 0$ if the initial voltage of capacitor at time $t = 0$ is $V_0 = 50$ V and the initial current of the inductor at time $t = 0$ is $I_0 = 0$ A. **[9 Marks]**

[15] (CO2/K4)

03. Find the h-parameters of the circuit shown in Fig. 4. Draw an equivalent circuit of the same. **[15 Marks]**

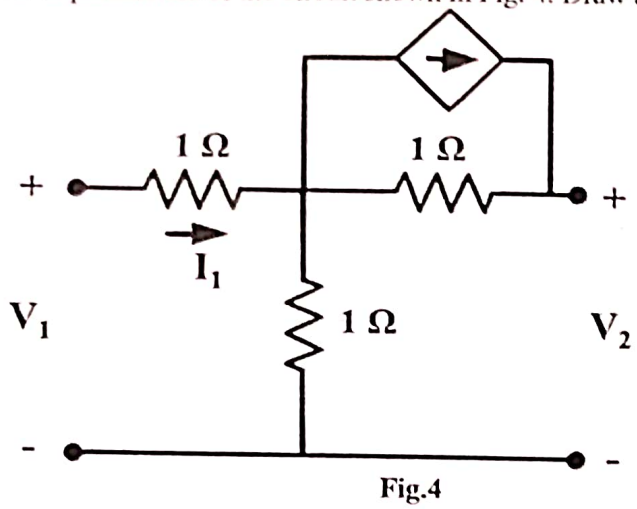

Fig.4

[15] (CO4/K3)

04. (a) Show that a series RL circuit is a low pass filter if the output is taken across the resistor. Calculate the corner frequency f_c if L = 2mH and R = 10kΩ. **[5 Marks]**

(b) Design an RL high pass filter that uses a 40-mH coil and has a cutoff frequency of 5 kHz. **[5 Marks]**

(c) Design a symmetrical lattice attenuator to have an attenuation of 20 dB, to work with a line having characteristic impedance of 800Ω. **[5 Marks]**

[15] (CO4/K2)

05. (a) Solve the circuit in Fig.5 using Laplace transform and find current i_1. **[9 Marks]**

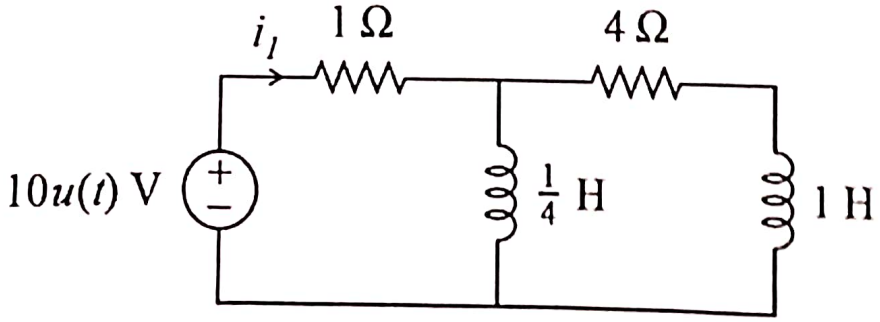

Fig.5

(b) When the input to a system is a unit step function, the response is 10 cos 4*t* *u(t)*. Obtain the transfer function of the system. **[6 Marks]**

[15] (CO5/K3)

06. (a) Find the Fourier Series representation of the input signal $v_{in}(t)$ shown in Fig.6. **[8 Marks]**

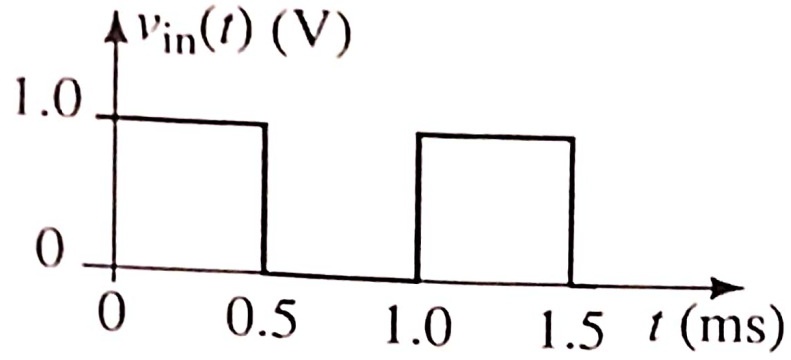

Fig.6

(b) Using the obtained Fourier Series in (a), determine the output voltage v_{out} of the circuit shown in Fig.7. **[7 Marks]**

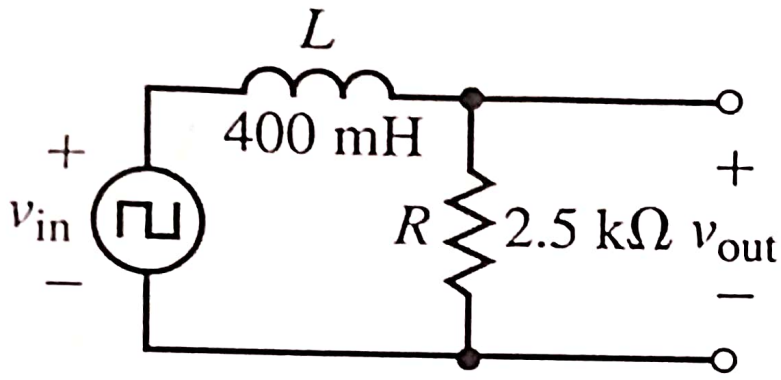

Fig.7

[15] (CO6/K3)

Section - II

Answer all Questions (1 × 10 Marks)

07. For the network graph given in Fig.8, write the tie-set and cut-set matrix. Take the twigs of the tree as branches 1, 2, 7, 8. **[10 Marks]**

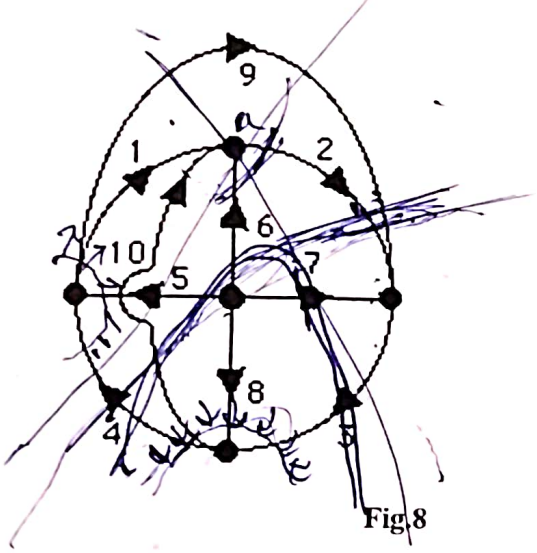

Fig.8

[10] (CO3/K3)

BL-Bloom's Taxonomy Levels - (K1-Remembering,K2-Understanding,K3-Applying,K4-Analysing,K5-Evaluating,K6-Creating)