VIT

Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)
CHENNAI

24BECI148.

Final Assessment Test(FAT) - Apr/May 2025

Programme	B.Tech.	Semester	Winter Semester 2024-25
Course Code	BECE203L	Faculty Name	Prof. Saurav Gupta
Course Title	Circuit Theory	Slot	D2+TD2+TDD2
		Class Nbr	CH2024250502895
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 and second-order circuits.
CO3: Able to solve the networks using a graphical approach.
CO4: Design and analyse two-port networks, passive filters, and attenuators.
CO5: Able to analyse the given network by transforming from the time domain to the S domain.
CO6: Analyse the given network using the Fourier series and transform from the time domain to the frequency domain.

Section - 1
Answer all Questions (6 × 15 Marks)

01. (a) Find Vx in the circuit in Fig.1 using Norton's theorem. Draw the Norton equivalent circuit. **[8 Marks]**

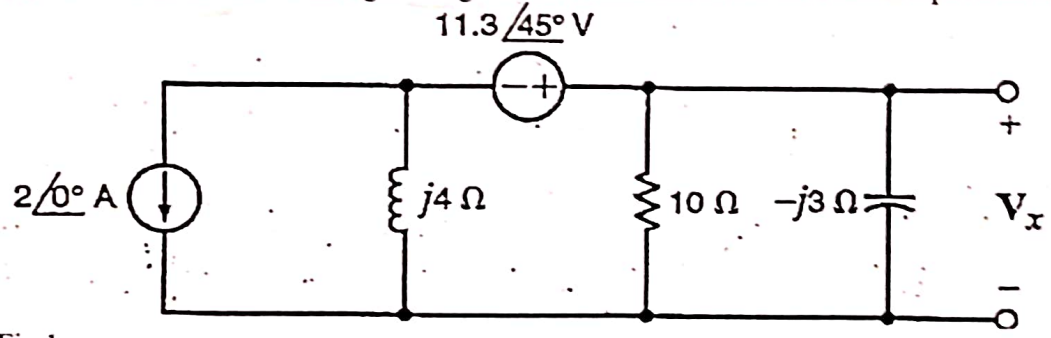

Fig.1

(b) Calculate the maximum average power absorbed by the 1Ω resistor in the network shown in Fig. 2 **[7 Marks]**

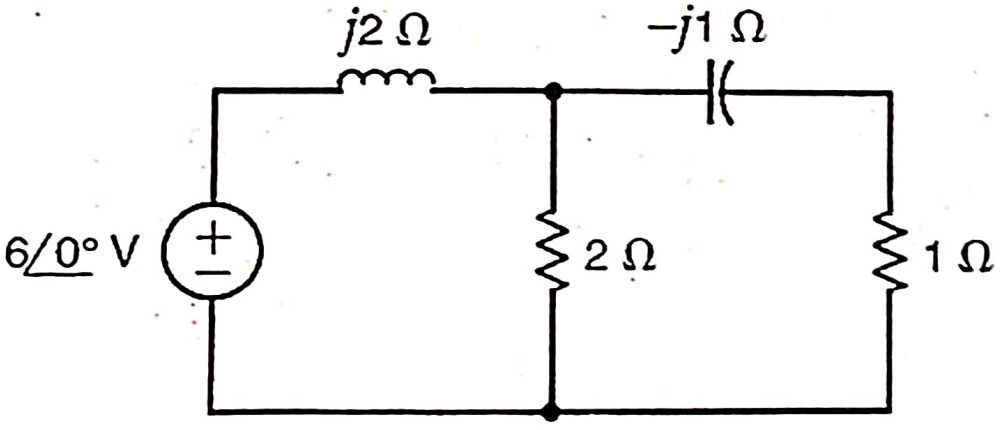

Fig.2

[15] (CO1/K3)

02. (a) The switch in Fig.3 is opened at t=0 after the circuit has reached steady state. Find the value of R and C such that α = 10 Np/s, and ω_0=30 rad/s. **[6 Marks]**

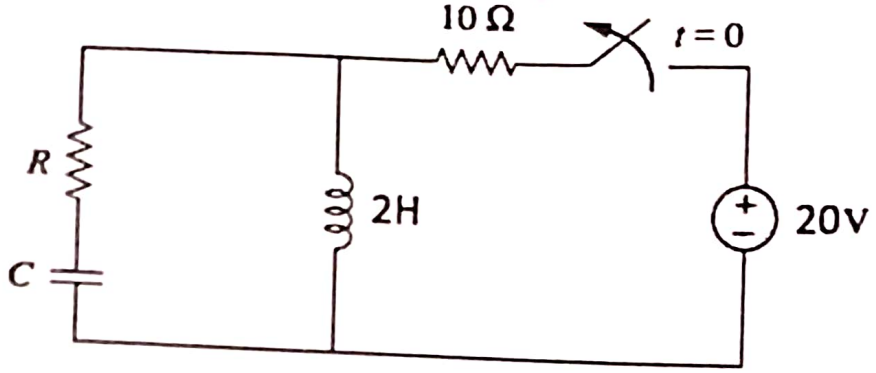

Fig.3

(b) Determine $v_0(t)$ for $t > 0$ in the circuit of Fig.4. **[9 Marks]**

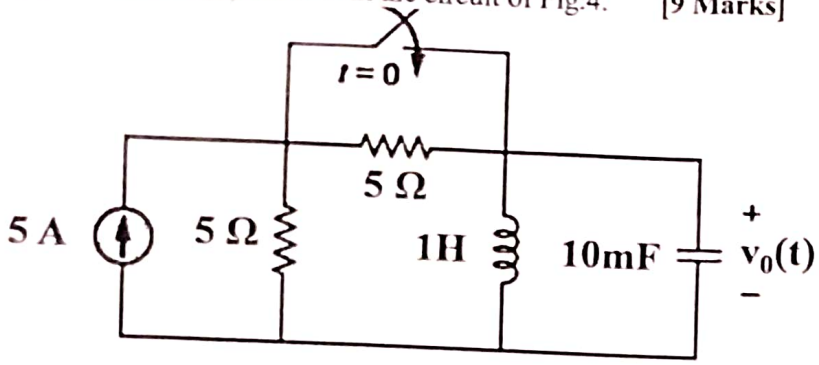

Fig.4

03. (a) In the two-port of Fig.5, let $Y_{12} = Y_{21} = 0$, Y_{11}= 4 mS, Y_{22} = 20 mS. Find V_o/V_s. **[7 Marks]** **[15] (CO2/K4)**

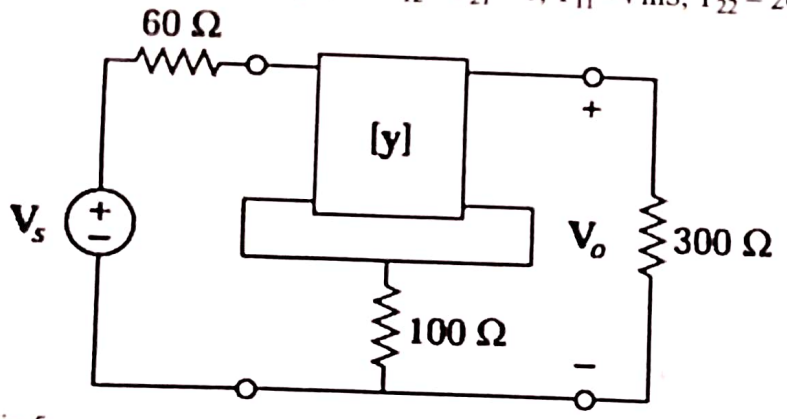

Fig.5

(b) Find the h parameters of the circuit in Fig.6. **[8 Marks]**

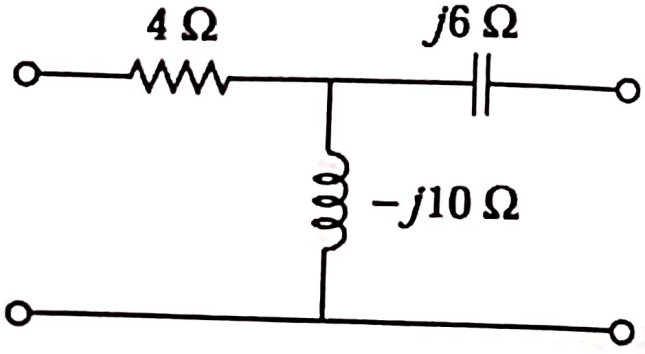

Fig.6

04. (a) Show that a series RL circuit is a high pass filter if the output is taken across the inductor. Calculate the corner frequency f_c if L = 0.1H and R = 200Ω. Also draw the circuit and highlight the input and output terminals. **[8 Marks]**

(b) Design a symmetrical bridged T-attenuator with an attenuation of 60 dB which is connected with a load of 500Ω. **[7 Marks]**

[15] (CO4/K2)

05. (a) Find the transfer function $H(s) = V_o(s)/V_i(s)$ for the circuit shown in Fig.7 Also find the output $v_o(t)$ when the input $v_i(t) = e^{-3t}\,u(t)$ **[6 marks]**

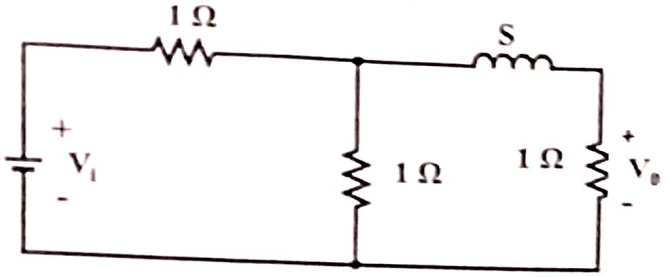

Fig.7

b)The input to the circuit shown in Fig. 8 is 12 V, at t=0 switch is closed. Determine the current in the inductor $i_L(t)$ for $t \geq 0$ by using Laplace transformation technique. **[9 Marks]**

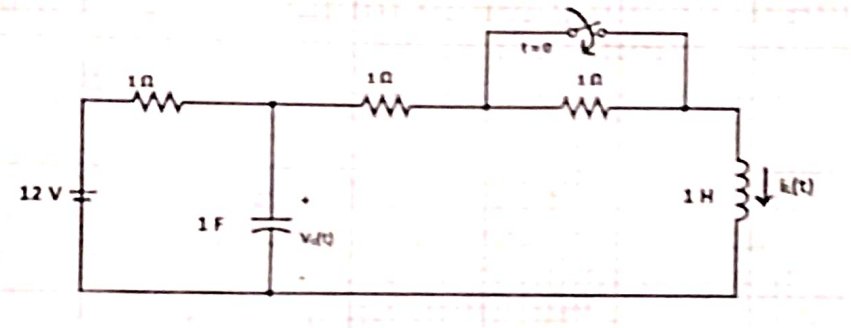

Fig.8

[15] (CO5/K3)

06. (a) Determine the Fourier series of input signal v_{in} (t) for the Fig.9. **[7 Marks]**

(b) Using the obtained Fourier Series of Q.6(a), determine the output voltage v_{out} (t) of the circuit shown in Fig.10. **[8 Marks]**

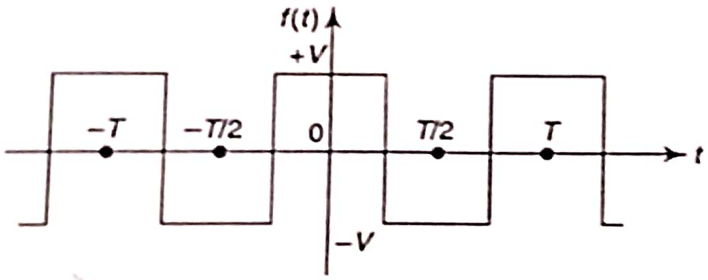

Fig.9

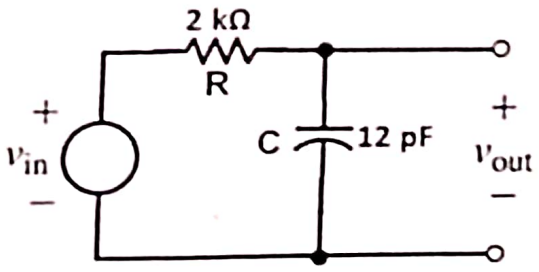

Fig.10

[15] (CO6/K3)

Section - II

Answer all Questions (1 × 10 Marks)

07. For the given circuit in Fig.11, find the following.
    (a) Network graph of the circuit. [2 Marks]
    (b) Incidence and reduced incidence matrix [3 Marks]
    (c) Cut-set matrix with branches ab, bc, bd as twigs [5 Marks]

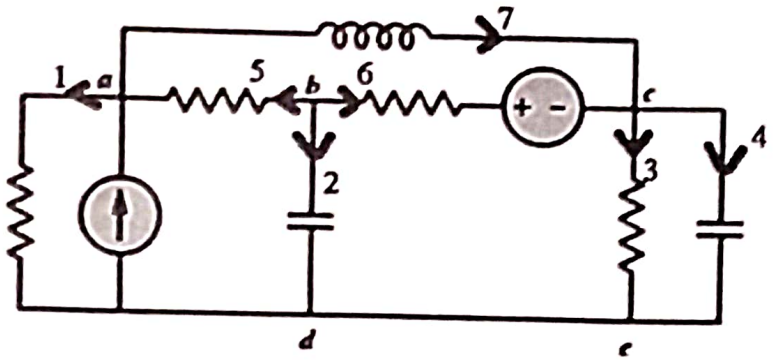

Fig.11

[10] (CO3/K3)

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

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