



SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai – 400058



END SEM/~~RE-EXAM~~ EXAMINATION ~~NOV~~/^{Dec}JAN 2025-26

Program: S.Y.B. Tech Ele - Sem III
Course Code: VE-BTE001
Course Name: Environmental Science and Sustainability

Duration: 120 Min
Maximum Points: 50
Semester: III

Instructions:

- 1 Attempt any five out of seven questions
- 2 Illustrate answer with neat sketches wherever required.
- 3 Make suitable assumptions where necessary and state them clearly.

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Q.No.	Questions	Points	CO	BL	Module No.
Q1					
a	Explain the multidisciplinary nature of environmental science and discuss why public awareness is essential for environmental protection.	5	2	1	1
b	Describe the four environmental segments: atmosphere, hydrosphere, lithosphere, and biosphere with their key characteristics.	5	2	2	1
Q2					
a	Explain biological pollutants. Differentiate between primary and corollary biological pollutants with examples.	5	2	1	1
b	What is meant by water pollution? Discuss inorganic pollutants and their environmental effects.	5	1	1	1
Q3					
a	Explain the process of ozone layer depletion due to CFCs using chemical reactions.	5	1	1	1
b	Explain particulate matter (PM). Describe how electrostatic precipitators (ESPs) control particulate emissions.	5	3	1	2
Q4					
a	Describe the working principle of biomass gasification using the four-zone downdraft gasifier model.	5	1,2	1	2
b	Describe biogas generation through anaerobic digestion. Explain design and working of a fixed-dome biogas plant.	5	2	3	2

**END SEM/RE-EXAM EXAMINATION NOV/JAN 2025-26**

Q5					
a	Explain the working of a single-crystal silicon solar cell. Discuss electron-hole pair formation and current generation.	5	2,3	1	3
b	Describe the tools used in energy audits such as blower door test, utility bill analysis, and thermal imaging.	5	1,3	2	3
Q6					
a	Explain the working mechanism of a wind turbine generator system. Illustrate energy conversion from wind to electricity.	5	1,3	1	2
b	Discuss offshore wind turbines. Explain their advantages and challenges.	5	2,3	1	3
Q6					
a	Define sustainability and explain the role of individuals in sustainability. Discuss conscious consumption and sustainable lifestyle practices.	5	2,1	1	4
b	Explain the working mechanism of carbon credits including emission reduction, verification, and trading.	5	3	2	4



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END SEMESTER November 2025 / ~~RE-EXAM January 2026~~

Program: S.Y. B. Tech. (Electrical) Sem III

Course Code: PC-BTE304

Course Name: Electromagnetic fields and waves

Duration: 3 hrs.

Maximum Points: 100

Semester: III

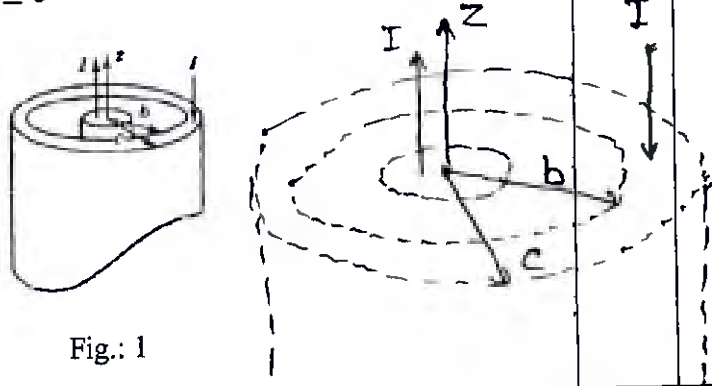
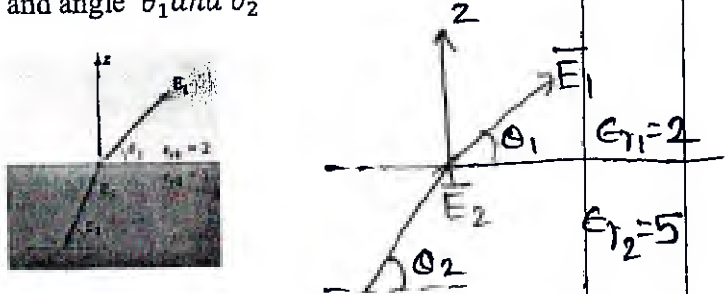
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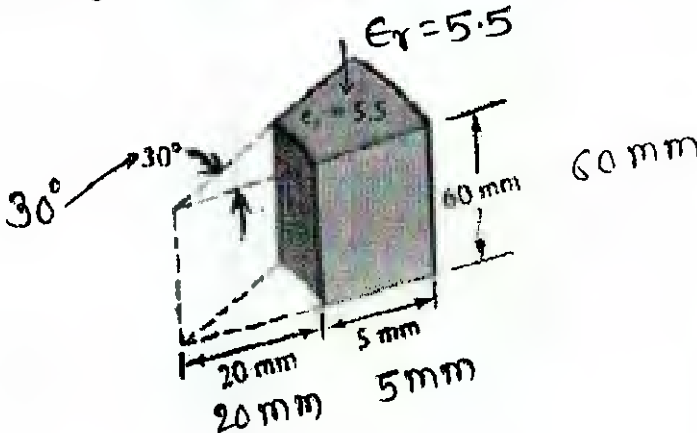
1. Question number 1 compulsory
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Q.No.	Questions	Pt.	CO	BL	Mod. No.
1.	Write Maxwell's equations for static and time varying fields in point form and integral form. Starting from the integral forms, derive the two curl equations: 1. $\nabla \times E = -\frac{\partial B}{\partial t}$ 2. $\nabla \times H = J_c + \frac{\partial D}{\partial t}$	20	1	L1	2,4,6
2.(a)	Write short note on 1. Wave Equations 2. Reflected waves and intrinsic impedance for various materials	10	1	L2	7
2.(b)	State Stoke's theorem. A circular conductor of radius $r_0 = 1\text{cm}$ has internal field $\vec{H} = \frac{10^4}{r} \left(\frac{1}{a^2} \sin ar - \frac{r}{a} \cos ar \right) \vec{a}_\phi \text{ (A/m)}$ Where, $a = \frac{2\pi}{r_0}$. Find the total current in the conductor.	07	3	L3	4
2.(c)	Use spherical coordinate to express differential volume, integrate to obtain the volume defined by $1 \leq r \leq 2$, $0 \leq \theta \leq \frac{\pi}{2}$ and $0 \leq \phi \leq \frac{\pi}{2}$	03	2	L1	1
3.(a)	A current filament of 10 A in the $-\hat{a}_y$ direction is parallel to y-axis at $x = 4\text{ m}$ and $z = 2\text{ m}$. Find \vec{H} at the origin.	05	2	L2	4
3.(b)	A ferrite material operates in a linear mode with $B = 0.05\text{ T}$, $\mu_r = 50$. Calculate values of χ_m , M and H .	05	3	L2	5



3.(c)	Given $\vec{H} = H_m e^{j(\omega t + \beta z)} \hat{a}_x$ in free space. Find \vec{E} .	04	2	L2	6
3.(d)	Current in the inner and outer conductors of Fig.1 are uniformly distributed. Use Ampere circuital law to derive expression of magnetic field intensity (H) for $b \leq r \leq c$	06	2	L3	4
	 <p style="text-align: center;">Fig.: 1</p>				
4.(a)	Prove that $\nabla \times H = J$ Explain physical significance of above Maxwell's equation.	10	1	L3	4
4.(b)	Given that $\vec{E}_1 = 9\hat{a}_x - 2\hat{a}_y + 15\hat{a}_z$ V/m at the charge free dielectric interface of Fig. 3. Find D_2 and angle θ_1 and θ_2	06	2	L3	3
	 <p style="text-align: center;">Fig. 3</p>				
4.(c)	Given electromagnetic wave equations are $\vec{E} = -E_m \sin(\omega t + \beta z) \hat{a}_x$ $\vec{H} = H_m \sin(\omega t + \beta z) \hat{a}_y$ Sketch E & H at $t = 0$.	04	3	L2	6
5.(a)	For a charge $Q = 10$ nC moving with uniform velocity of 10^7 m/s and direction is specified by the unit vector $\hat{a}_v = \hat{a}_x + \hat{a}_y + \hat{a}_z$ Determine the force exerted on the charge if	07	2	L3	5



	1. $B = \hat{a}_x + 2\hat{a}_y + 3\hat{a}_z \text{ mwb/m}^2$ 2. $E = 3\hat{a}_x + 2\hat{a}_y + \hat{a}_z \text{ KV/m}$				
5.(b)	Determine the amplitude of the transmitted & reflected E & H at the interface, 1. If $E_0^i = 2 \times 10^{-3} \text{ V/m}$ in region 1 in which $\epsilon_{r1} = 6.5, \mu_{r1} = 1$ and $\sigma_1 = 0$. 2. Region 2 is free space (Assume normal incidence)	07	2	L3	7
5.(c)	Identical charges of Q (C) are located at the eight corners of a cube with side of l meter show that coulombs force on each charge has magnitude $\left(\frac{3.29Q^2}{4\pi\epsilon_0 l^2}\right) N$.	06	2	L2	2
6.(a)	Derive an expression for the electric field intensity due to an infinite line charge.	10	2	L2	2
6.(b)	A linear, homogeneous, isotropic dielectric material has permittivity $\epsilon_r = 3.6$ and covers the space between $z=0$ and $z=1$. If $V = -6000z$ V in material. Find- (i) \vec{E} (ii) \vec{P} (iii) ρ_s .	05	4	L3	3
6.(c)	Find the capacitance between the inner and outer curved conductor surfaces shown in fig. 2. Neglect fringing. <div style="text-align: center;">  <p>Fig. 2</p> </div>	05	2	L3	3
7.(a)	Derive an expression for the energy stored in static electric field of n point charges.	10	2	L2	2



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7.(b)	Given the conduction current density in lossy dielectric as $J_c = 0.02 \sin 10^9 t$ (A/m^2). Find the displacement current density if $\sigma = 10^2 S/m$ and $\epsilon_r = 8.5$.	05	1	L3	6
7.(c)	Calculate the flux passing the portion of the plane $\phi = \frac{\pi}{4}$ defined by $0.02 < \rho < 0.06 m$ and $0 < Z < 2 m$ for a current of 4 A. The flux density at a point, distance ρ from a long filamentary current I in \hat{a}_z direction is given by $\vec{B} = \frac{\mu_0 I}{2\pi\rho} \hat{a}_\phi$. (Draw neat diagram)	05	1	L2	4



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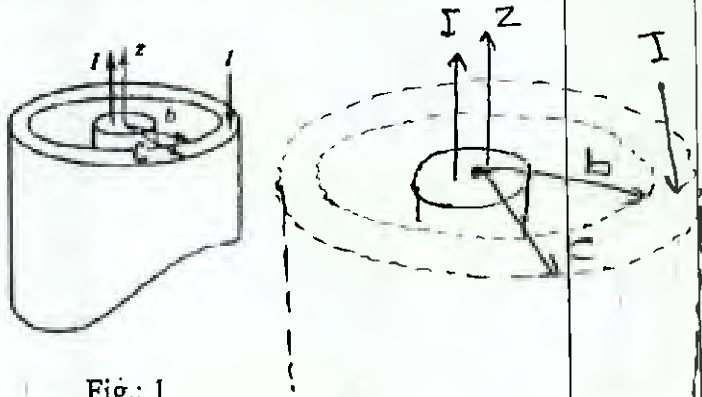
~~END SEMESTER November 2025~~ / RE - EXAM January 2026

Program: S.Y. B.Tech. (Electrical) *Sem III*
Course Code: PC-BTE304
Course Name: Electromagnetic fields and waves

Duration: 3 hrs. *13/11/26*
Maximum Points: 100
Semester: III

Notes:

1. Question number 1 compulsory
2. Attempt any four questions out of remaining six.
3. Draw neat diagrams
4. Assume suitable data if necessary

Q.No.	Questions	Points	CO	BL	Mod. No.
1.(a)	Identical charges of $Q(C)$ are located at the eight corners of a cube with side of l meter show that coulombs force on each charge has magnitude $\left(\frac{3.29Q^2}{4\pi\epsilon_0 l^2}\right) N$.	06	2	L2	2
1.(b)	Current in the inner and outer conductors of Fig.1 are uniformly distributed. Use Ampere circuital law to derive expression of magnetic field intensity (H) for $b \leq r \leq c$	07	2	L3	4
	 <p style="text-align: center;">Fig.: 1</p>				
1.(c)	Determine the amplitude of the transmitted & reflected E & H at the interface, 1. If $E_0^i = 2 \times 10^{-3} V/m$ in region 1 in which $\epsilon_{r1} = 6.5, \mu_{r1} = 1$ and $\sigma_1 = 0$. 2. Region 2 is free space (Assume normal incidence)	07	2	L3	7



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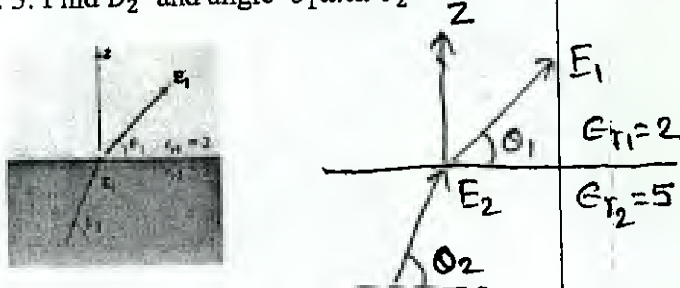
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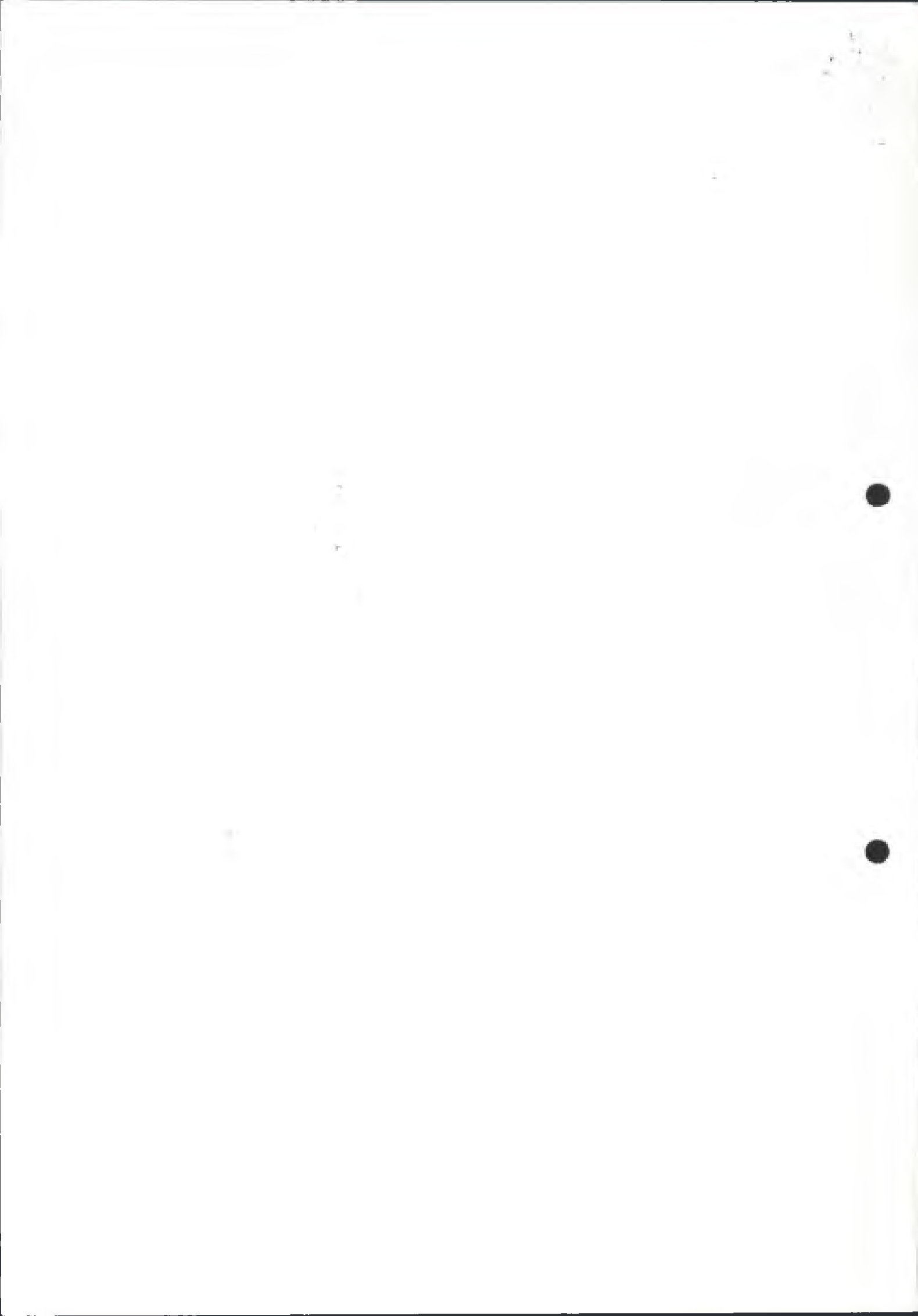


~~END SEMESTER November 2025~~ / RE - EXAM January 2026

2. (a)	Starting with Ampere's circuital law, derive Maxwell's equation in integral form. Obtain the corresponding relation by applying the Stoke's theorem	14	1	L3	4
2.(b)	For a charge $Q = 10 \text{ nC}$ moving with uniform velocity of 10^7 m/s and direction is specified by the unit vector $\vec{V} = -0.5\hat{a}_x + \hat{a}_y - 0.71\hat{a}_z$ Determine the force exerted on the charge if 1. $B = \hat{a}_x + 2\hat{a}_y + 3\hat{a}_z \text{ mwb/m}^2$ 2. $E = 3\hat{a}_x + 2\hat{a}_y + \hat{a}_z \text{ KV/m}$	06	2	L3	5
3.	Write Maxwell's equations for static fields in point form and integral form. Derive Maxwell equations for time varying fields. Explain physical significance of each equation.	20	3	L2	6
4.(a)	Derive an expression for the energy stored in static electric field of n point charges.	10	2	L2	2
4.(b)	Calculate the flux passing the portion of the plane $\phi = \frac{\pi}{4}$ defined by $0.02 < \rho < 0.06 \text{ m}$ and $0 < Z < 2 \text{ m}$ for a current of 4 A. The flux density at a point, distance ρ from a long filamentary current I in \hat{a}_z direction is given by $\vec{B} = \frac{\mu_0 I}{2\pi\rho} \hat{a}_\phi$. (Draw neat diagram)	05	1	L2	4
4.(c)	A ferrite material operates in a linear mode with $B = 0.05 \text{ T}$, $\mu_r = 50$. Calculate values of χ_m , M and H .	05	3	L2	5
5.(a)	Given the conduction current density in lossy dielectric as $J_c = 0.02 \sin 10^9 t \text{ (A/m}^2\text{)}$, find the displacement current density if $\sigma = 10^2 \text{ S/m}$ and $\epsilon_r = 8.5$.	05	1	L3	6
5.(b)	Find the voltage across each dielectric in the capacitor shown in Fig. 2 when the applied voltage is 500 V. (Given: $\epsilon_{r1} = 5$ & $\epsilon_2 = \epsilon_0$)	05	2	L3	3
5.(c)	Derive an expression for the electric field intensity due to an infinite line charge.	10	2	L2	2



6.(a)	Derive Poisson's and Laplace's equations.	05	1	L2	3
6.(b)	Given electromagnetic wave equations are $\vec{E} = -E_m \sin(\omega t + \beta z) \hat{a}_z$ $\vec{H} = H_m \sin(\omega t + \beta z) \hat{a}_y$ Sketch E & H at $t = 0$.	03	3	L2	6
6.(c)	Given that $\vec{E}_1 = 9\hat{a}_x - 2\hat{a}_y + 15\hat{a}_z$ V/m at the charge free dielectric interface of Fig. 3. Find D_2 and angle θ_1 and θ_2	06	2	L3	3
	 <p style="text-align: center;">Fig. 3</p>				
6.(d)	A linear, homogeneous, isotropic dielectric material has permittivity $\epsilon_r = 3.6$ and is covering the space between $z=0$ and $z=1$. If $V = -6000z$ V in material. Find- (i) \vec{E} (ii) \vec{P} (iii) ρ_s .	06	4	L3	3
7.(a)	Write short note on 1. Wave Equations 2. Reflected waves and intrinsic impedance for various materials	10	1	L2	7
7.(b)	State Stoke's theorem. A circular conductor of radius $r_0 = 1$ cm has internal field $\vec{H} = \frac{10^4}{r} \left(\frac{1}{a^2} \sin ar - \frac{r}{a} \cos ar \right) \hat{a}_\phi$ (A/m) Where, $a = \frac{2\pi}{r_0}$. Find the total current in the conductor.	07	3	L3	4
7.(c)	Use spherical coordinate to express differential volume, integrate to obtain the volume defined by $1 \leq r \leq 2$, $0 \leq \theta \leq \frac{\pi}{2}$ and $0 \leq \phi \leq \frac{\pi}{2}$.	03	2	L1	1





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End Sem/ Re-Exam - November 2025 Examinations

Program: Electrical

Course Code: PC-BTE303

Course Name: Digital Electronics

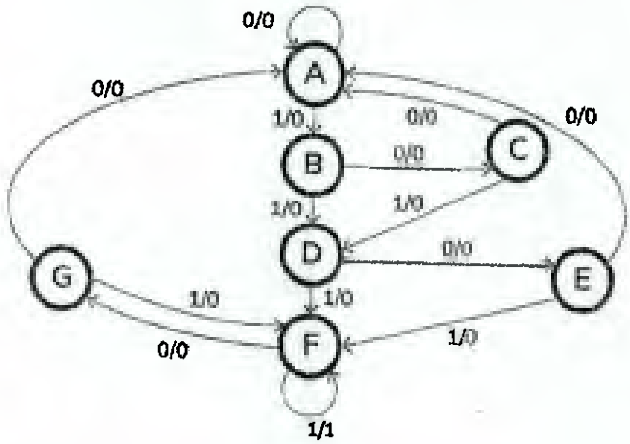
Duration: 3 hours

Maximum Points: 100

Semester: III

- Attempt any 5 questions from the given 7 questions.
- Make suitable assumptions wherever necessary.

28/11/25

Q.No.	Questions	Points	CO	BL
1a.	Reduce the following using K-maps and implement using NAND Gates only. $F(A, B, C, D, E) = \sum m(1,4,5,6,7,9,17,21,25,29)$	10	1	3
1b.	As an application of Shift Registers Explain the working of 4-bit Ring counter. What is the limitation of this counter and discuss how it can be overcome.	10	2	2
2a.	 <p>Obtain reduced state diagram for the above given state diagram using the state reduction technique.</p>	08	3	3
2b.	Implement the following equation $g = \prod M(0,1,3,6,9,11,14,15)$ using i. Single 8:1 Mux and additional Gates ii. Single 4:1 Mux and additional Gates	12	2	3
<p>Note: The above equation is a function of variable A(MSB), B, C, D(LSB)</p>				



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3a.	Perform the following i. $(101101)_2 = (?)_8$ ii. $(A2C4)_{16} = (?)_{10}$ iii. $(10011)_2 - (11001)_2$ using 1's compliment method iv. $(46)_{10} = (?)_{XS-3}$ v. $(1111)_{gray} = (?)_2$	10	1	3
3b.	i. Explain the race-around condition present in a normal JK flip-flop. ii. If the the edge triggered clock is not to be used then how can race round condition be eliminated ? Discuss in brief with Logic circuit and timing diagram.	10	2	2
4a.	Explain Moore machine with example.	10	3	2
4b.	Design a Mod 6 ripple counter using JK flip flop which goes through following states. <p>Note: The clock used is positive edge triggered clock.</p>	10	2	3
5a.	Do the following conversion: i. S-R flip flop to JK flip flop ii. D flip flop to T flip flop	10	2	3
5b.	Discuss the Programmable Logic Array	10	4	2
6a.	Design 9 bit even parity checker circuit. Use appropriate IC for the same.	10	2	3



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End Sem/ ~~Re-Exam~~ - November 2025 Examinations

6b.	Explain the following terms related to Logic Families i. Speed of operation ii. Voltage parameters iii. Current sink and current source iv. Noise immunity and noise margin v. Operating temperature	10	4	2
7a.	Draw the state diagram of JK flip flop as a Moore machine state diagram.	10	3	3
7b.	Explain the working of CMOS NAND and NOR gates.	10	4	2





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~~End Sem~~ / Re Exam - November 2020 Examinations
 JAN

S.Y. B.Tech (Elect) Sem III

Program: Electrical

Duration: 3 hours

Course Code: PC-BTE303

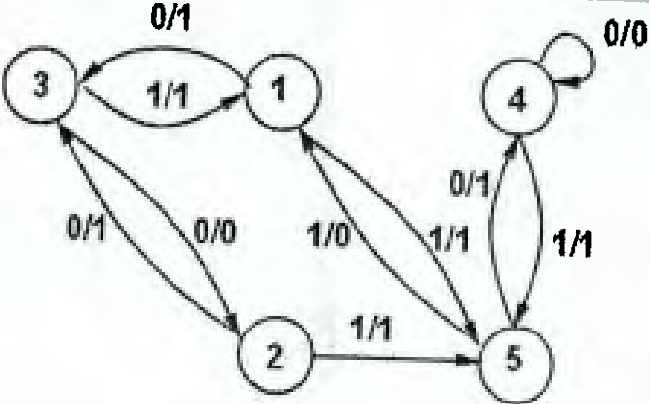
Maximum Points: 100

Course Name: Digital Electronics

Semester: III

- Attempt any 5 questions from the given 7 questions.
- Make suitable assumptions wherever necessary.

12/11/20

Q.No.	Questions	Points	CO	BL
1a.	Explain Mealy machine with example.	10	3	2
1b.	Discuss the timing requirement if 64-bit addition is to be performed using Full Adder. Assume delay of 3 input XOR gate to be 0.5ns, 2 input AND gate to be 0.3ns and 3 input OR gate to be 0.4ns. If time plays a very important role and if the output needs to be fast, suggest an alternate circuit for the same. Discuss how this alternate circuit helps improve overall speed of the adder.	10	2	3
2a.	 <p>Obtain reduced state diagram for the above given state diagram using the state reduction technique.</p>	08	3	3
2b.	Perform the following <ol style="list-style-type: none"> Generate the hamming code for data 1011. $(101101)_2 = (?)_{\text{gray}}$ $(A2C4)_{16} = (?)_{\text{BCD}}$ $(10011)_2 - (11001)_2$ using 2's compliment method $(37)_{10} - (?)_{\text{XS-3}}$ $(234.23)_8 = (?)_{16}$ 	12	1	3

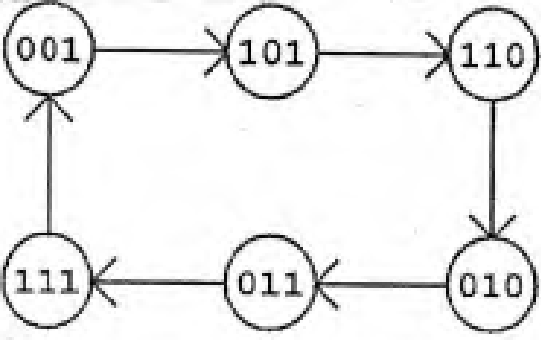


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~~End Sem~~ / Re Exam - November 2025 Examinations

3a.	Implement the following using 1:8 De-Mux i. 3 input NOR gate ii. $AB + A'C$	10	2	3
3b.	Design XS-3 to BCD code converter	10	1	3
4a.	Design the following counter using SR flip flop. 	10	2	3
4b.	Design a sequence generator for the following sequence using Left shift register 101100	10	2	3
5a.	Design 9 bit even parity generator circuit. Use appropriate IC for the same.	10	2	3
5b.	Explain the following terms related to Logic Families i. Speed of operation ii. Voltage parameters iii. Current sink and current source iv. Noise immunity and noise margin v. Operating temperature	10	4	2
6a.	Draw the state diagram of JK flip flop as a Moore machine state diagram.	10	3	3
6b.	Explain different types of Flip Flops with their truth table. Explain the importance of Clear and Preset inputs.	10	2	2
7a.	Explain the working of TTL NOR gates.	10	4	2
7b.	Discuss the Programmable Array Logic	10	4	2



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End semester/RE Examination Nov 25



Program: SY Btech., Electrical Engineering Sem III

Duration: 3 hours

Course Code: PC-BTE302

Maximum Points: 100

Course Name: Electrical Networks

Semester: III

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicates full marks.

26/11/25

Q. No	Questions	Poi nts	C O	B L	M od ule
1a.	Find the open-circuit impedance matrix of the two-port network given. 	4	3	3	7
b	Find current through the 10ohm resistor using Thevenin's theorem 	6	1	3	1

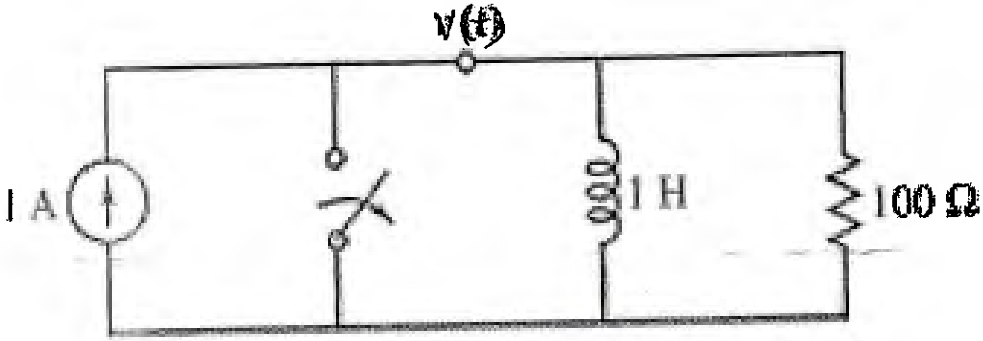
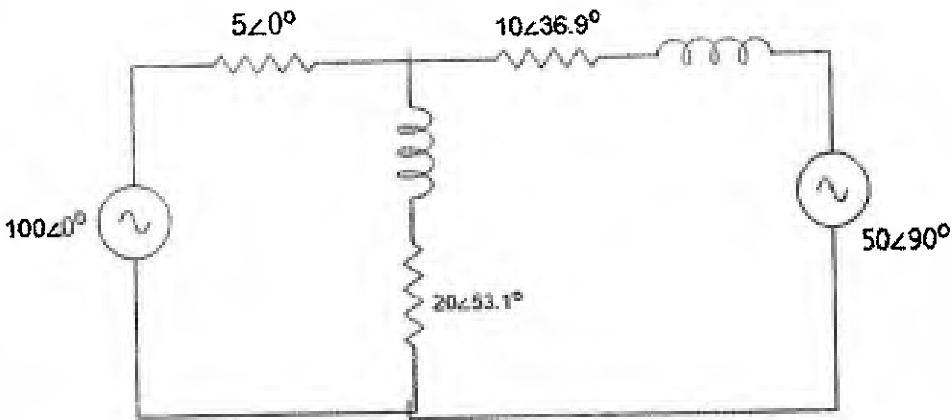
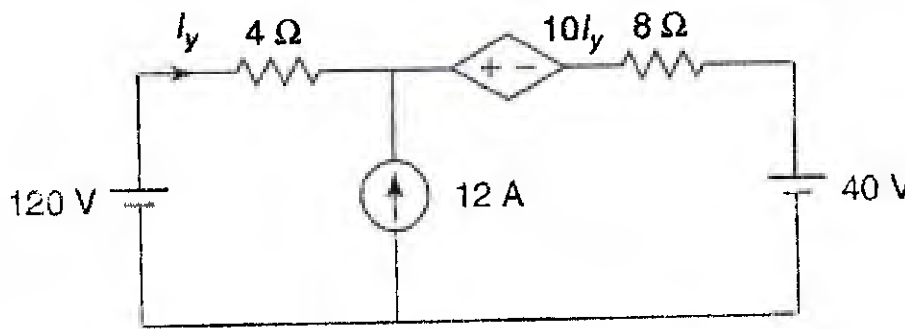


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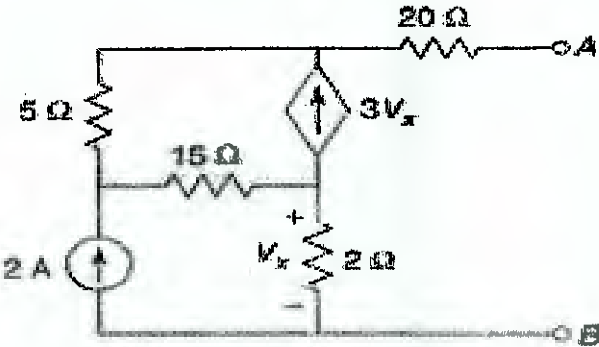
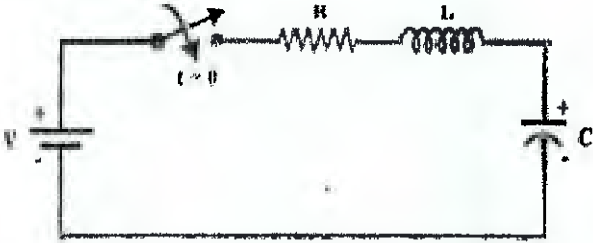
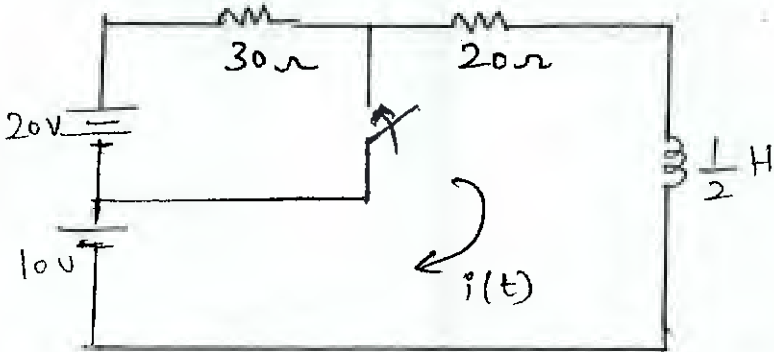
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End semester/~~RE~~ Examination Nov 25

1c.	For the network shown switch is opened at $t=0$, determine $v, dv/dt, d^2v/dt^2$ at $t=0^+$ 	6	2	3, 4	3
1d	Find the node voltages. 	4	2	3, 4	2
2a.	Find the current I_y by Superposition theorem 	10	1	3	1



2b	<p>Obtain the Norton's equivalent circuit.</p> 	10	1	3	1
3a.	<p>In the network shown the switch is closed at $t=0$. Assume initial conditions are zero. $V=200\text{ V}$, $R=200\ \Omega$, $L=0.1\text{ H}$, $C=10\ \mu\text{F}$. Determine whether the circuit is over damped, critically damped or underdamped. Find $V_L(0^+)$ and $V_L(\infty)$ (time domain)</p> 	10	2	3, 4	4
3b.	<p>In the given network, steady state is reached with the switch open. The switch is closed at $t = 0$. Obtain expressions for $i(t)$ for $t > 0$</p> 	10	2	3, 4	4

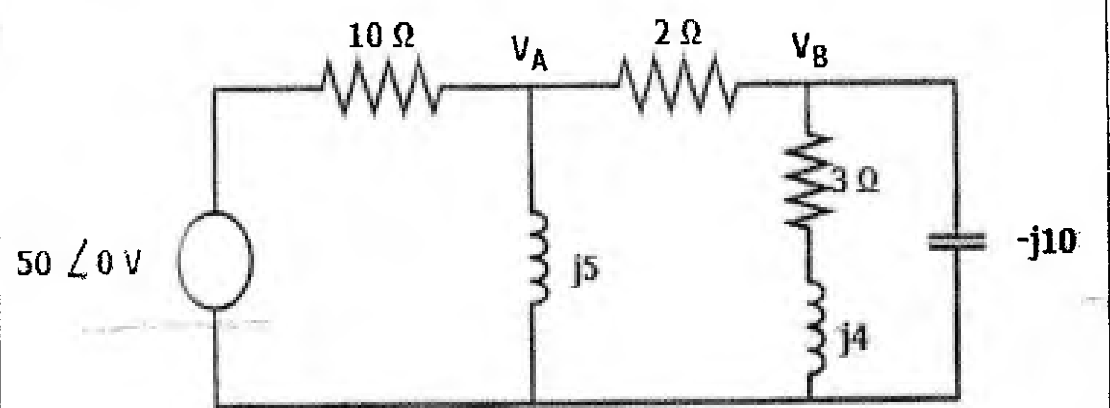
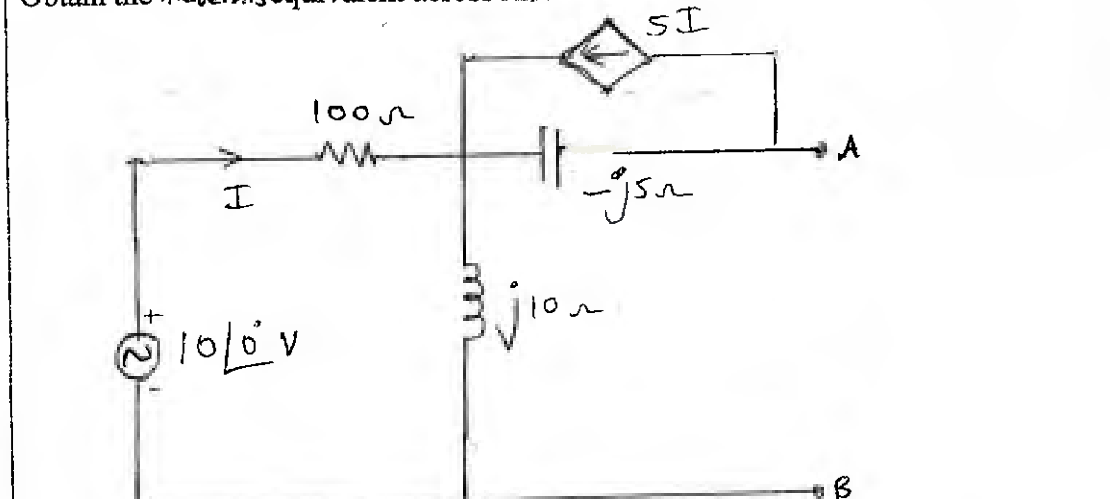


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End semester/RE Examination Nov 25

4a.	Find the node voltages. 	10	1	3	2
4b.	Obtain the Thevenin's equivalent across AB. 	10	2	3, 4	2



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End semester/~~RE~~ Examination Nov 25



Q5	<p>In the given network switch is closed at $t=0$. Find the current $i_1(t)$ for $t > 0$ (Using Laplace transform). Initial current through the inductor is zero and initial voltage on the capacitor is 4V</p>	10	2	3	5
				4	
5b.	<p>Determine the current $i(t)$ when the switch is closed at $t=0$ (Using Laplace transform) Assume zero initial conditions in the network.</p>	10	2	3,	5
	<p>$R=5\Omega, L=1H, C=0.24 F, V=6e^{-2t}$</p>			4	

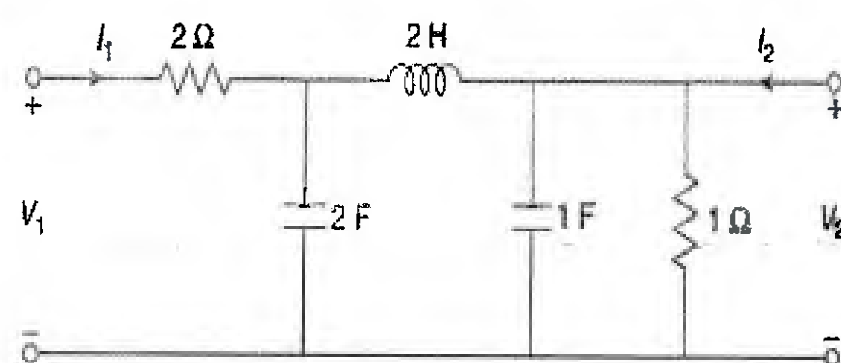
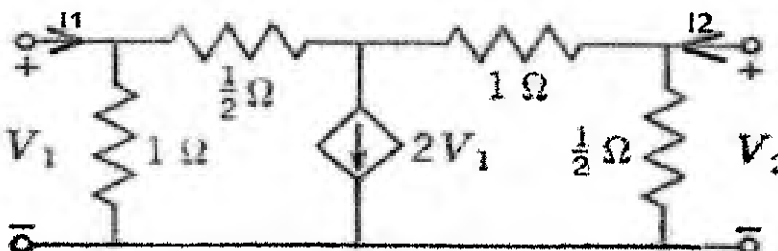
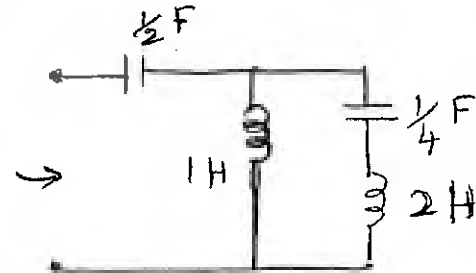


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~~End semester~~ RE Examination Nov 25



6a	Derive ABCD parameters and h parameters for two port network.	10	3	3	7
6b	Determine the voltage transfer ratio for the given network 	10	3	3	6
7a	Determine short circuit admittance parameters and open circuit impedance parameters for the given network . 	10	3	3	7
7b	Find the driving point admittance of the given network. 	5	3	3	6
7c	Derive the expression for transient current in case of RC circuit excited by DC supply V(assume zero initial conditions). Define time constant for the same and draw the plots of i(t) and Vc(t).	5	2	2, 3	4



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~~END SEM~~ / Re-exam AY ~~(24-25)~~ 25-26



Program: SY Btech., Electrical Engineering *sum 111*

Duration: 3 hours

Course Code: PC-BTE302

Maximum Points: 100

Course Name: Electrical Networks

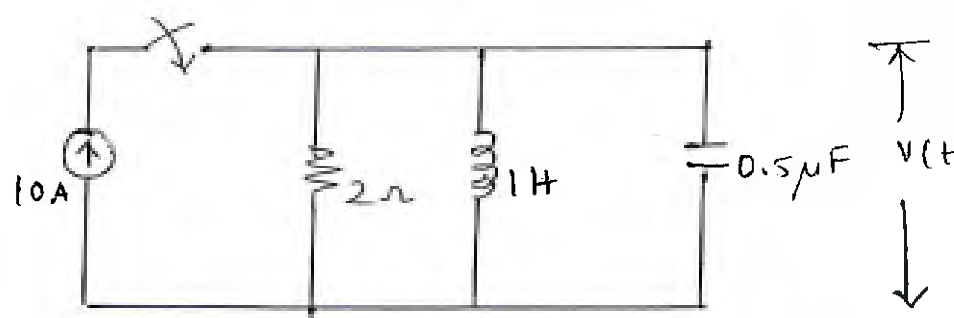
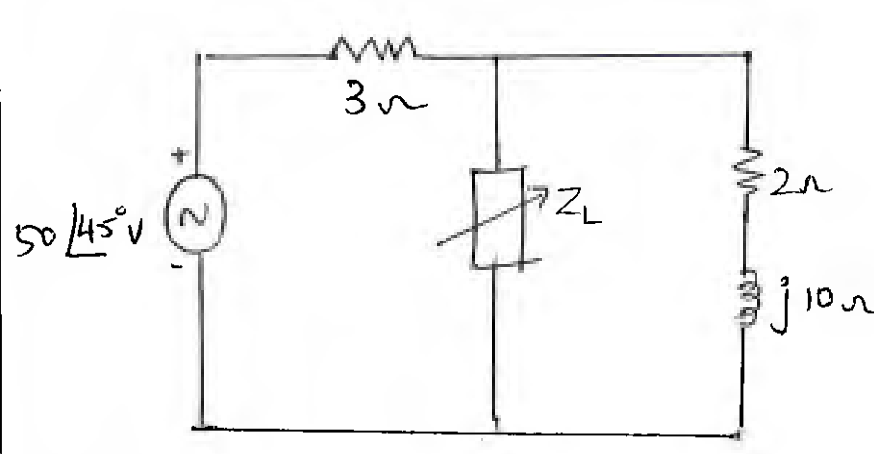
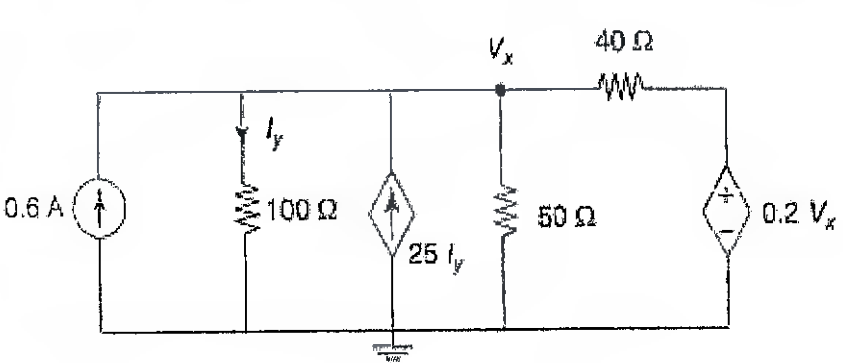
Semester: III

- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicates full marks.

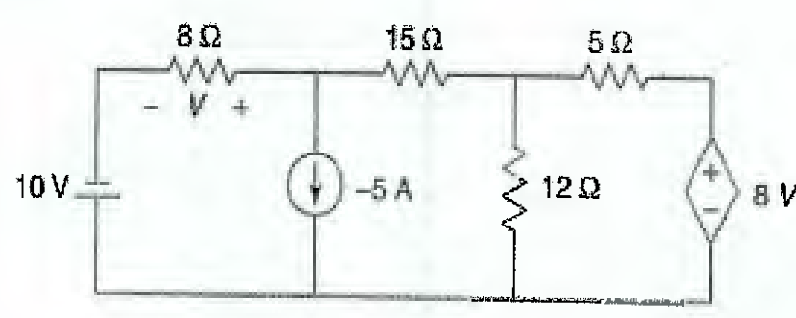
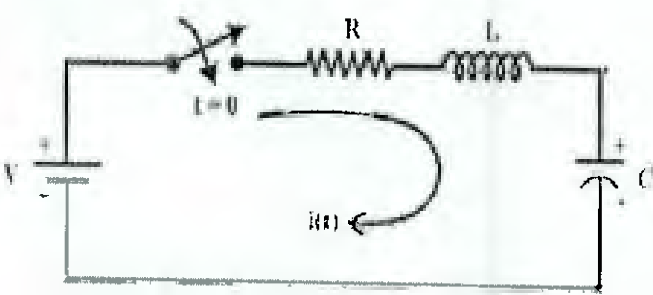
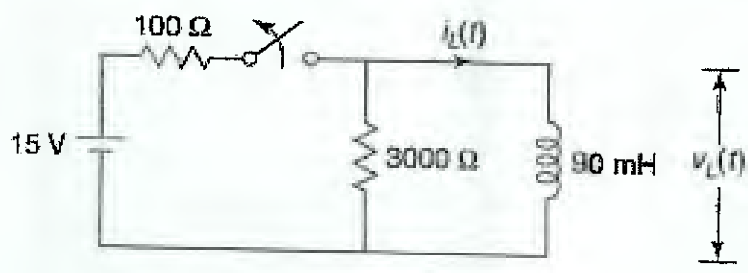
9/11/26

Q. No	Questions	Poi nts	C O	B L	M od ule
1a.	<p>Currents I_1 and I_2 entering at port 1 and port 2 respectively of a two port network are given by the following equations:</p> $I_1 = 0.5V_1 - 0.2V_2$ $I_2 = -0.2V_1 + V_2$ <p>Find Y and Z parameters for the network.</p>	4	3	3	7
b	<p>Find the voltage at node 2 of the given network</p>	4	1	3	1

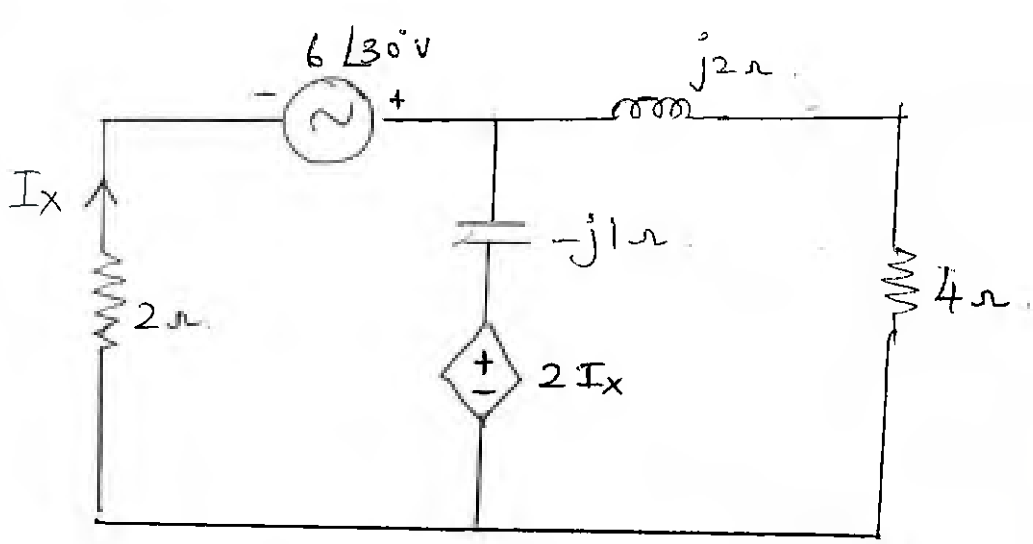
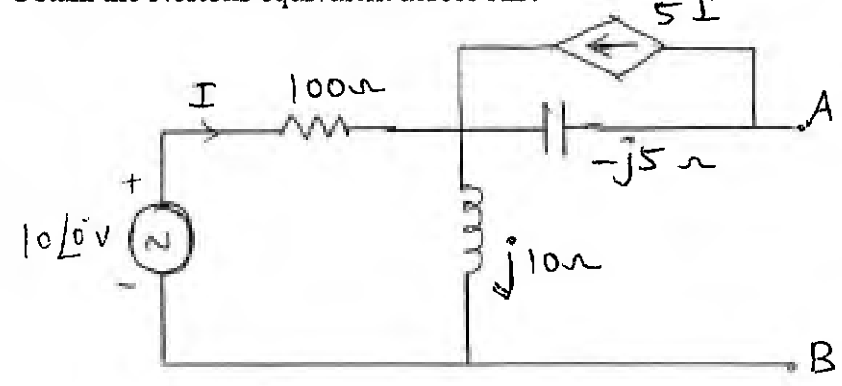


1c.	<p>For the network shown switch is closed at $t=0$, determine $v, dv/dt, d^2v/dt^2$ at $t=0^+$</p> 	6	2	3, 4	3
1d	<p>For the maximum power transfer find the value of Z_L for the given network and calculate the maximum power</p> 	6	2	3, 4	2
2a.	<p>Find the voltage V_x by nodal analysis:</p> 	8	1	3	1



2b	<p>Find the voltage V using superposition theorem.</p> 	12	1	3	1
3a.	<p>In the network shown the switch is closed at $t=0$. Assume no initial conditions. Obtain the value of at $t=0.1$ second (time domain) $V=10$ V, $R=2$ Ω, $L=1$ H, $C=1/5$ μF. Determine whether the circuit is over damped, critically damped or underdamped.</p> 	10	2	3, 4	4
3b.	<p>For the following network, steady state is reached with the switch closed. The switch is opened at $t = 0$. Obtain expressions for $i_L(t)$ and $v_L(t)$.</p> 	10	2	3, 4	4

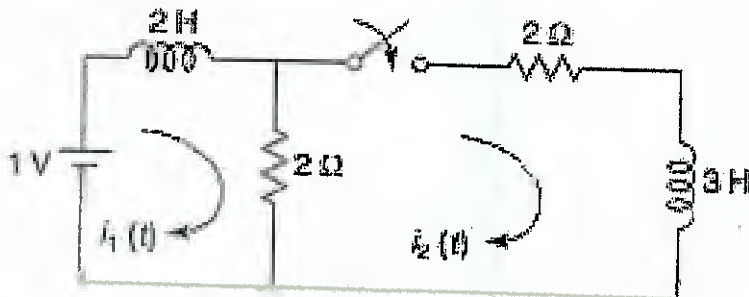


4a.	Find the voltage across 4 ohm resistor by mesh analysis	10	1	3	2
					
4b.	Obtain the Nortons equivalent across AB.	10	2	3, 4	2
					



Q5 In the given network switch is closed at $t=0$, steady state being reached before $t=0$. determine the current through the 3 H inductor. for $t>0$ (Using Laplace transform)

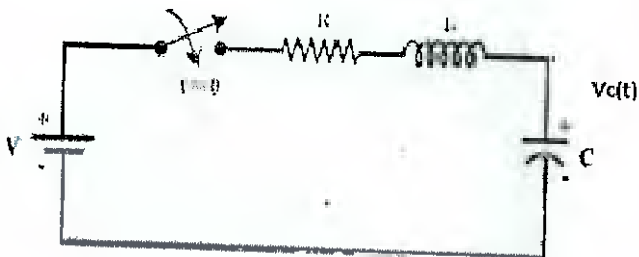
10 2 3 4



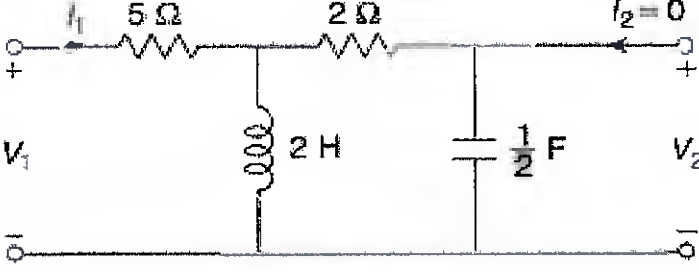
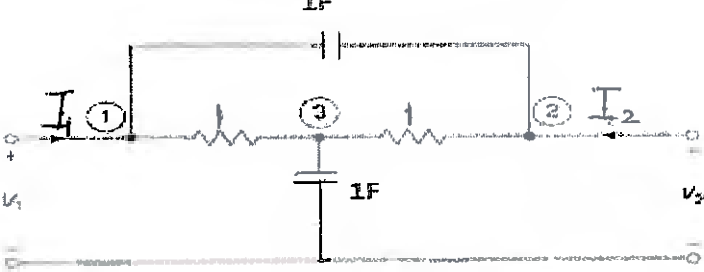
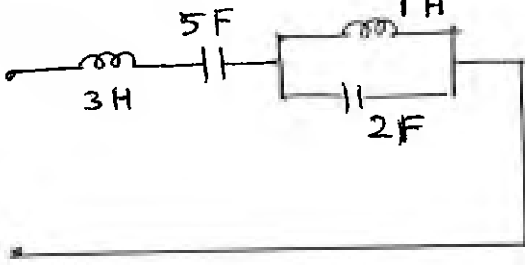
5b. Find the impulse response of the voltage across the capacitor in the network shown. Also determine the $V_C(t)$ for step input (Using Laplace transform)

10 2 3, 4 5

$R=10\Omega, L=2H, C=2F.$





6a	Derive ABCD parameters and h parameters for two port network.	10	3	3	7
6b.	<p>Determine the driving-point impedance $\frac{V_1}{I_1}$, transfer impedance $\frac{V_2}{I_1}$ and voltage transfer ratio $\frac{V_2}{V_1}$.</p> 	10	3	3	6
7a.	<p>Determine short circuit admittance parameters for the given network .</p> 	10	3	3	7
7b.	<p>Find the driving point admittance of the given network.</p> 	5	3	3	6
7c.	<p>Derive the expression for transient current in case of RL circuit excited by DC supply V (assume zero initial conditions). Define time constant for the same and draw the plots of $i(t)$ and $V_L(t)$.</p>	5	2	2, 3	4



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END SEMESTER December 2025

Program: Electrical Engineering

~~Exam~~ February 2026

Duration: 3 Hrs.

Course Code: PC-BTE301

S.Y. B.Tech-Ele-Sem III

Maximum Points: 100

Course Name: Analog Circuits

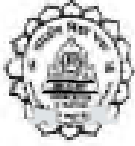
Semester: III

Instructions: 1. Solve any FIVE Questions.

2. Assume suitable data if required.

2411125

Q. No.	Questions	Points	CO	BL	Module No.
1	a) For circuit diagram as shown in Fig. 1 answer the following: i) Identify the type of Power Amplifier represented by this diagram. State its efficiency. (2M) ii) Sketch the output voltage waveform obtained across R_L with respect to input voltage waveform (3M).	5	1	2	1
	b) For an amplifier shown in Fig. 2, Sketch the AC equivalent circuit and derive equations of its lower cutoff frequencies due to C_1 only.	5	1	2	2
	c) Looking at the waveforms of IC555 circuit shown in Fig. 3, answer the following. The timing capacitor plays very important role in the operation of IC555. Part A: Identify the mode of operation of IC555 (1M). Sketch the waveforms at Pin 2, 3, and V_C across capacitor (2M). Part B: Now, the input as shown is applied to Reset Pin 4, keeping Pin 2 input same, sketch the waveforms at Pin 2, 3, 4 and V_C across capacitor (2M).	5	2	2	3
	d) With the help of graphical representation, describe simple current limiting and fold back current limiting used in DC voltage regulators. *Explanation does not carry any mark.	5	3	2	4
	e) Sketch the ideal frequency responses of Low Pass, High Pass, Band Pass and Band Reject filters (2M). Now sketch the frequency response First Order and Second Order Low Pass practical filter and justify that as the Order of the filter increases, the frequency response of the practical filter approaches to ideal frequency response (3M).	5	4	2	5
	2	a) Do you think there is any problem at the output voltage of the Power Amplifier circuit as shown in Fig. 1? If Yes. Modify this circuit diagram to solve any such problem (if any).	5	1	2
b) Use the equation of lower cutoff frequency due to C_1 derived in Q1b for an amplifier in Fig. 2, calculate the numerical value of this cutoff frequency for $V_{CC} = 10\text{ V}$, $R_S = 680\ \Omega$, $R_1 = 68\text{ k}\Omega$, $R_2 = 22\text{ k}\Omega$, $R_E = 1\text{ k}\Omega$, $R_C = 2.2\text{ k}\Omega$, $R_L = 10\text{ k}\Omega$, $C_1 = 0.1\ \mu\text{F}$, $C_2 = 0.1\ \mu\text{F}$ and $C_E = 10\ \mu\text{F}$, $h_{te} = 1.1\text{ K}\Omega$ and $h_{fe} = 100$ and $h_{oe} = 0\ \Omega$.		5	1	2	2
c) Construct the functional block diagram of IC723 DC Voltage Regulator. Clearly label this block diagram. *Explanation does not carry any mark.		5	3	2	4
d) State any five advantages of Active filters over & Passive Filters.		5	4	2	5
e) Identify the type of negative feedback amplifier shown in Fig. 4 (1M). State the alternative names of this topology (2M). Tabulate the equations of gain, input and output resistance of this amplifier with feedback (3M).		5	4	2	6



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END SEMESTER December 2025

3	a) Sketch the complete circuit diagram of the Power Amplifier with highest efficiency (5M). Compare various types of Power Amplifiers (PA) with respect to its conduction angle, operating point, and % efficiency (5M).	10	1	2	1
	b) Design an appropriate circuit using IC555 timer such that the RED and GREEN LEDs alternatively turns ON and OFF at 1 sec interval (5M). Sketch the circuit diagram with selected standard values of components for the same clearly showing interfacing of LEDs at the output (5M).	10	2	4	3
4	a) Design a circuit using an appropriate IC such that the output remains high for 1msec when an appropriate input is applied at the trigger input of this IC (5M). Construct the circuit using standard values of components used (5M).	10	2	4	3
	b) Design a DC voltage regulator for maximum DC output voltage $V_{OUT} = 5V$ and maximum load current $I_{LMAX} = 100 \text{ mA}$ (5M). Sketch the circuit diagram with selected standard values of components (5M).	10	3	4	4
5	a) Design a second Order Low Pass filter for the highest cutoff frequency of 1.59 kHz and Pass Band Gain = 1.586 (5M). Sketch its circuit diagram using standard values of components used (5M).	10	5	4	5
	b) For the negative feedback system as shown in Fig. 4, construct the transistorized circuit diagram which uses this type of negative feedback (5M). State any three the advantages of negative feedback (2M). Describe any one of the advantage using appropriate mathematical equations and proof (3M).	10	4	2	6
6	a) Identify the type of active filter as shown in Fig. 5 (1M). Determine its corner frequency and gain (6M). Sketch the approximate nature of the frequency response of this filter indicating Pass Band and Stop (Attenuation) Band (3M).	10	5	2	5
	b) Design any of the types of Radio Frequency (RF) Oscillator for a sinusoidal oscillations of 1 MHz and 12 Vpp (7M). Sketch it using standard values of components used (3M).	10	5	4	7
7	a) Justify that Common Emitter Amplifier with un bypassed Emitter Resistor is a very good example of Voltage Series negative feedback configuration. Construct the circuit diagrams indicating that (6M). Moreover, sketch the labelled block diagrammatic representation of this topology in support of your justification (5M).	10	4	3	6
	b) Identify the type of oscillator circuit shown in Fig. 6 (1M). Whether this will oscillate; Yes OR No (1M). If Yes, justify it satisfies Barkhausen's criteria for oscillation (5M). What will be the frequency of oscillation at the output (3M).	10	5	3	7



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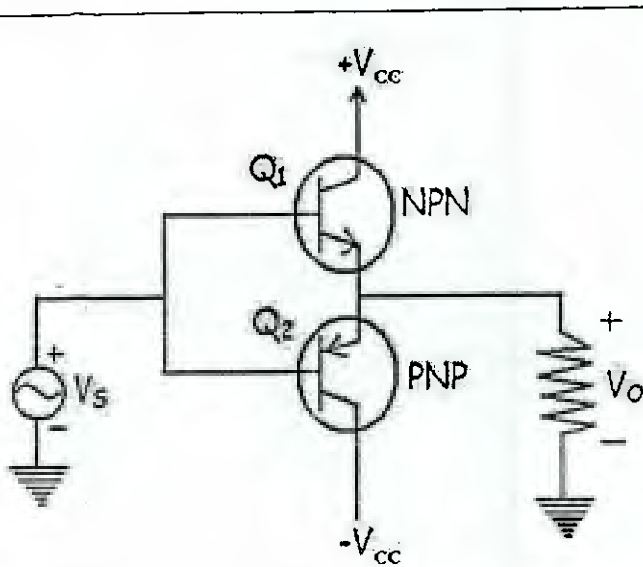


Fig. 1

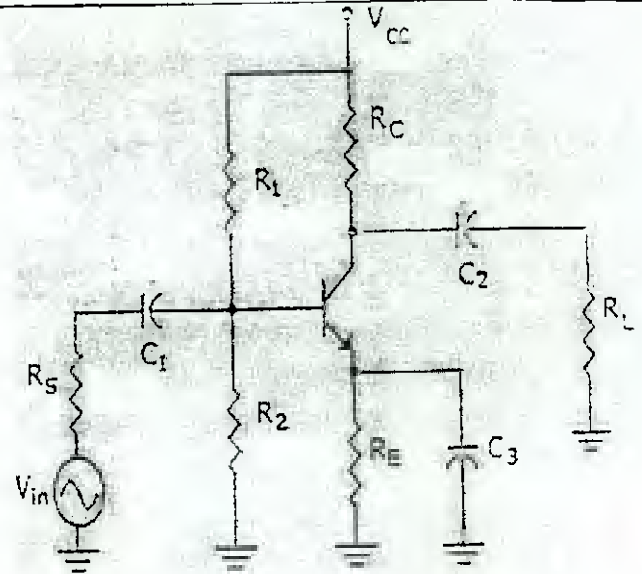


Fig. 2

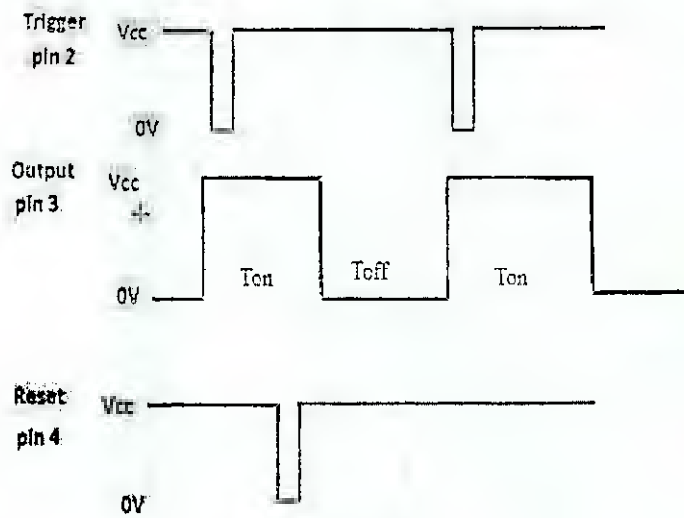


Fig. 3



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END SEMESTER December 2025

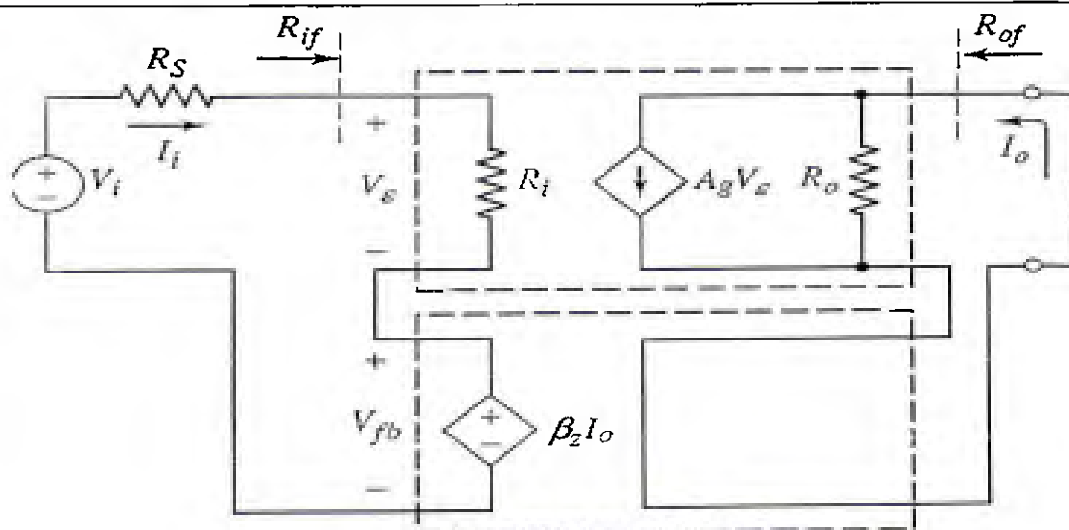


Fig. 4

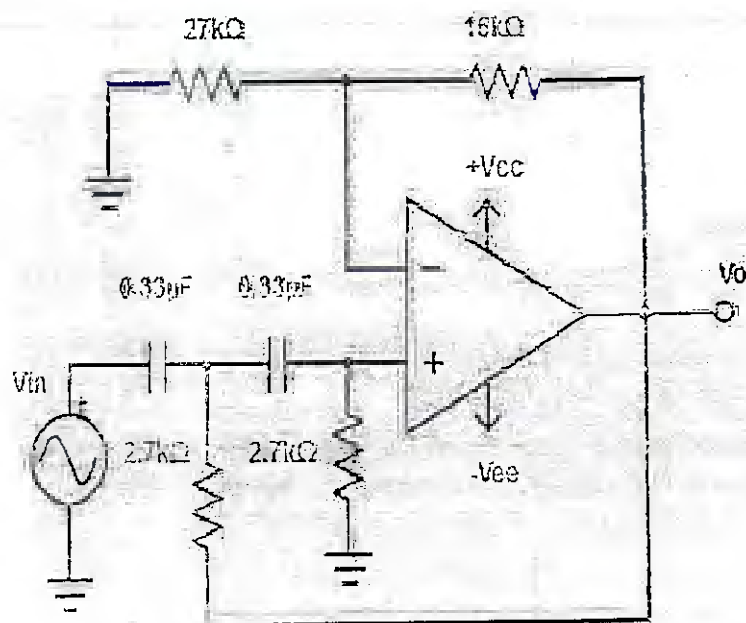


Fig. 5

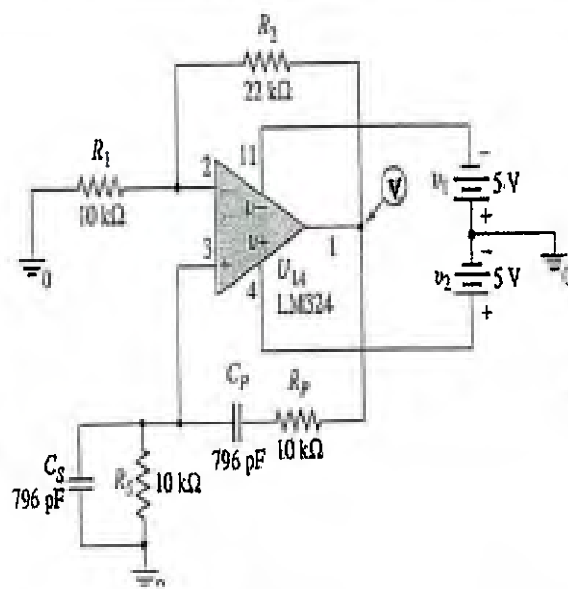


Fig. 6



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~~END SEMESTER December 2025~~

RE - EXAM February 2026

7/1/26

Program: Electrical Engineering *S.Y. S. Text Sem III*

Duration: 3 Hrs.

Course Code: PC-BTE301

Maximum Points: 100

Course Name: Analog Circuits

Semester: III

Instructions: 1. Solve any FIVE Questions.
2. Assume suitable data if required.

Q. No.	Questions	Points	CO	BL	Module No.
1	a) With respect to the following circuit diagram shown in Fig. 1 answer the question given. i) Identify the circuit and state its efficiency in %. (2 M) ii) What transformer turns ratio (N_1/N_2) is required to match a 16Ω speaker load so that effective load resistance seen at the primary is $10 k\Omega$. (3M)	5	1	2	1
	b) For an amplifier shown in Fig. 2, Sketch the AC equivalent circuit and derive equations of its lower cutoff frequencies due to C_2 only.	5	1	2	2
	c) Sketch the functional block diagram of IC555.	5	2	2	3
	d) Sketch the circuit diagram of IC723-voltage-regulator for Low Voltage Low Current Application with fold back current limiting. *Explanation does not carry any mark.	5	3	2	4
	e) Fill in the blanks. [Hint:, Bessel, Elliptic, Butterworth Chebyshev] The key characteristic of the _____ filter is that it has a flat passband as well as a flat stopband. This is the reason that it is sometimes called a _____ filter. The _____ filter has a ripple passband but a flat stopband. The _____ filter has a ripple passband as well as a ripple stopband. Generally, the _____ filter provides the best stopband response among the four type of filters.	5	4	2	5
	a) Sketch the circuit diagram of class AB Power Amplifier.	5	1	2	1
2	b) Use the equation of lower cutoff frequency due to C_2 derived in Q1b for an amplifier in Fig. 2, calculate the numerical value of this cutoff frequency in kHz. Assume $h_{ie} = 1.1 k\Omega$ and $h_{fe} = 100$ and $h_{oe} = 0 \Omega$.	5	1	2	2
	c) Construct the functional block diagram of a series type variable DC voltage regulator which has short circuit current limiting feature. Clearly indicate this on the block diagram. *Explanation does not carry any mark.	5	3	2	4
	d) Answer the following: A _____ filter rejects all frequencies within a specified band and passes all those outside this band. A _____ filter significantly attenuates all frequencies below f_c and passes all frequencies above f_c . Active filters consists of Amplifier. [True/False]. Active filters attenuates the inputs signal. [True/False] 2 nd order filters have poor frequency response than 1 st order. [True/False]	5	4	2	5
	e) Identify the type of negative feedback amplifier shown in Fig. 3 (1M). State the alternative names of this topology (2M). Tabulate the equations of gain, input and output resistance of this amplifier with feedback (2M).	5	4	2	6



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RE - EXAM February 2026

3	a) Sketch the complete circuit diagram of the Power Amplifier with highest efficiency (5M). Compare various types of Power Amplifiers (PA) with respect to its conduction angle, operating point, and % efficiency (5M).	10	1	2	1
	b) Design an appropriate circuit using IC555 timer for an output of 1kHz and 50% duty cycle (5M). Sketch the circuit diagram with selected standard values of components for the same clearly showing interfacing of LEDs at the output (5M).	10	2	4	3
4	a) Sketch the circuit diagram of mono-stable multi-vibrator using IC 555 timer (5M). Sketch the relevant waveforms of this circuit (5M).	10	2	4	3
	b) Design a DC voltage regulator for maximum DC output voltage $V_{OUT} = 5V$ and maximum load current $I_{LMAX} = 50 \text{ mA}$ (5M). Sketch the circuit diagram with selected standard values of components (5M).	10	3	4	
5	a) Design a second Order High Pass filter for the lowest cutoff frequency of 1.59 kHz and Pass Band Gain = 1.586 (5M). Sketch its circuit diagram using standard values of components used (5M).	10	5	4	5
	b) For the negative feedback system as shown in Fig. 3, construct the circuit diagram (transistorized/op-amp based) which uses this type of negative feedback (5M). State any three the advantages of negative feedback (2M). Describe any one of the advantage using appropriate mathematical equations and proof (3M).	10	4	2	6
6	a) Identify the type of active filter as shown in Fig. 4 (1M). Determine the values of resistors and capacitor of this circuit for a 1.59 kHz corner frequency and 2 gain (6M). Sketch the approximate nature of the frequency response of this filter indicating Pass Band and Stop (Attenuation) Band (3M).	10	5	2	5
	b) Design any of the types of op-amp based Audio Frequency (AF) Oscillator for a sinusoidal oscillations of 1 kHz and 10 Vpp (7M). Let us assume that op-amp has $+V_{CC} = 15 \text{ V}$ and $-V_{EE} = -15 \text{ V}$. Sketch it using standard values of components used (3M).	10	5	4	7
7	a) Answer the following: i) What would be the value of feedback voltage in a negative feedback amplifier with $A=100$; $\beta = 0.03$ and input signal voltage = 40mv? (2M) ii) A system has a gain of 80dB without feedback. If the negative feedback fraction is 1/50th. Calculate the closed-loop gain of the system in dB with the addition of negative feedback. (6M)	10	4	3	6
	iii) The open-loop voltage gain of an amplifier is 240. The noise level in the output without feedback is 100 mV. If negative feedback with $\beta = 1/60$ is used. Calculate the noise level in the output. (2M) b) State the Barkhausen's criteria for oscillation (2M). Sketch the circuit diagram of op-amp based RC phase shift oscillator (3M). Justify how this circuit satisfies Barkhausen's criteria (4M). State its equation of frequency of oscillation (1M).	10	5	3	7



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RE - EXAM February 2026

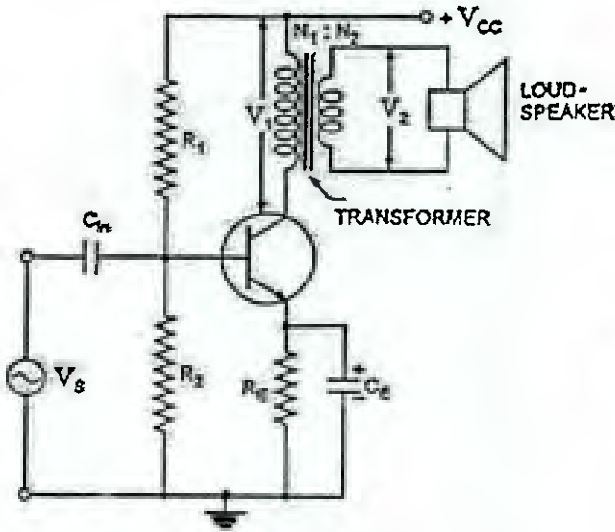


Fig. 1

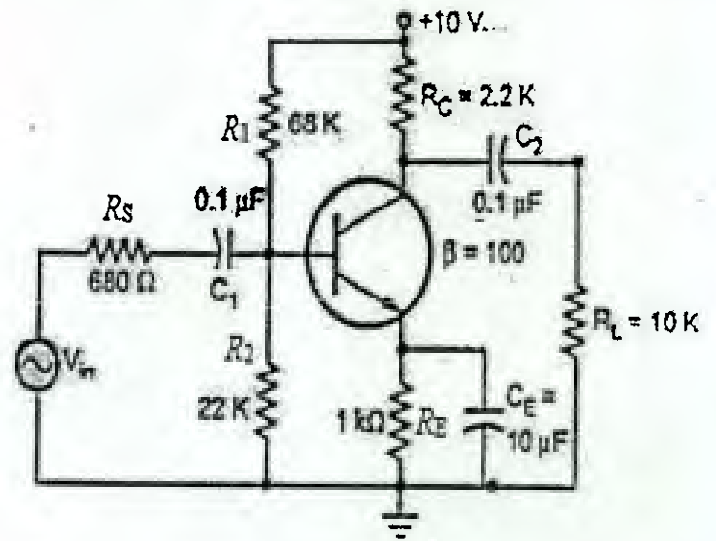


Fig. 2

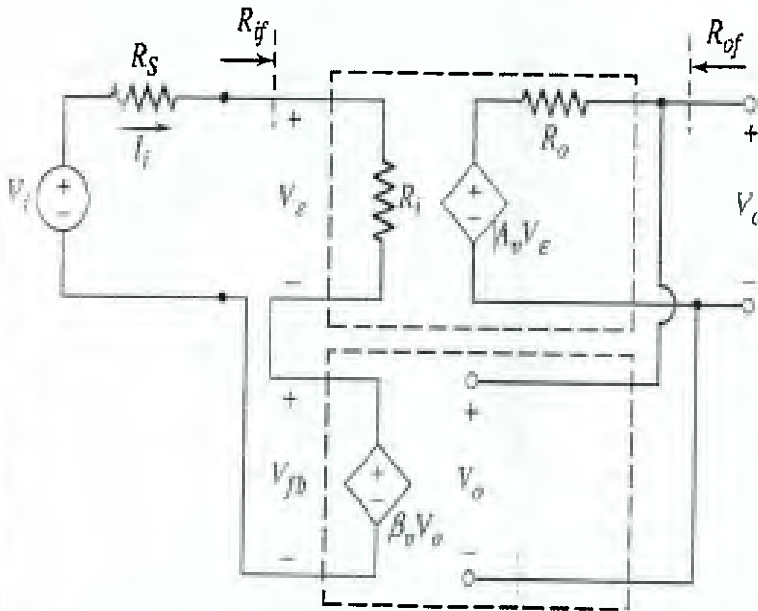


Fig. 3

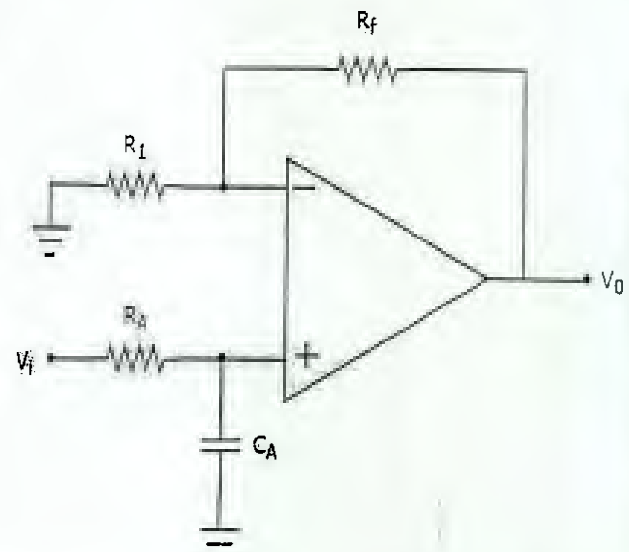


Fig. 4





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END SEMESTER November 2025 / RE-EXAM January 2026

Program: Electrical S.Y.B.Tech Ele - Sem III Duration: 3 hours

Course Code: BS-BTE301

Maximum Points: 100

Course Name: Laplace transform, vector calculus & Linear algebra

Semester: III

Notes: 1) Attempt any 5 out of 7 questions

2) Use of non-programmable calculator is allowed.

211125

Q.No.	Questions	Points	CO	BL	Mod No.
1a)	Find a unit vector normal to the surface $xy^3z^2 = 4$ at point $(-1, -1, 2)$	06	2	1, 2	3
1b)	If $A = \begin{bmatrix} 5 & 3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, Find two non singular matrices P and Q such that $PAQ = I$. Hence find A^{-1} .	06	3	1, 2, 3	6
1c)	Evaluate: $\mathcal{L}^{-1} \left\{ \log \left(1 + \frac{1}{s^2} \right) \right\}$	08	1	2, 3	2
2a)	Test for consistency and solve: $5x + 3y + 7z = 4, 3x + 26y + 2z = 9, 7x + 2y + 10z = 5$	06	3	1, 3	6
2b)	Prove that $\nabla \left(\frac{\vec{a} \cdot \vec{r}}{r^n} \right) = \frac{\vec{a}}{r^n} - \frac{n(\vec{a} \cdot \vec{r})\vec{r}}{r^{n+2}}$ Find the Laplace transforms of $f(t)$, where	06	2	2	7
2c)	$f(t) = \begin{cases} t^2, & 0 < t < 1 \\ 0, & t > 1 \end{cases}$	08	1	1, 2, 3	1



Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai - 400058



END SEMESTER November 2025 / RE-EXAM January 2026

3a)	Verify Divergence Theorem for $\vec{F} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ taken over the bounded by the cylinder $x^2 + y^2 = 4, z = 0, z = 3$	10	2	1,3	5
3b)	Use Cayley-Hamilton theorem to find $2A^5 - 3A^4 + A^2 - 4I$ where $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$.	10	3	2,3	7
4a)	Find all the eigen values and eigenvectors of the matrix $A = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$	06	3	1,2,3	7
4b)	Evaluate $\mathcal{L}^{-1} \left\{ \frac{6s-4}{s^2-4s+20} \right\}$	06	1	1,2	2
4c)	Verify Stoke's theorem for the vector field $\vec{F} = (x^2 - y^2)\hat{i} + 2xy\hat{j}$ over the box bounded by planes $x = 0, x = a, y = b, z = C$ if the face $z = 0$ is cut.	08	2	1,2	5
5a)	Prove that $\nabla \times \left(\frac{\vec{a} \times \vec{r}}{r^n} \right) = \frac{(2-n)\vec{a}}{r^n} + \frac{n(\vec{a} \cdot \vec{r})\vec{r}}{r^{n+2}}$	06	2	1,2,3	3
5b)	Evaluate $L \{ e^{-1} (3 \sinh 2t - 5 \cosh 2t) \}$	06	1	1,3	1
5c)	Find the rank of the matrix $\begin{bmatrix} -1 & 2 & 3 & -2 \\ 2 & -5 & 1 & 2 \\ 3 & -8 & 5 & 2 \\ 5 & -12 & -1 & 6 \end{bmatrix}$	08	3	2,3	6
6a)	If $A = \frac{1}{3} \begin{pmatrix} 1 & 2 & a \\ 2 & 1 & b \\ 2 & -2 & c \end{pmatrix}$ is orthogonal find a, b and c	06	3	1,3	6



SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai - 400058



END SEMESTER November 2025 / RE - EXAM January 2026

6b)	If $\vec{F} = x^2 \hat{i} + (x-y) \hat{j} + (y+z) \hat{k}$ displace a particle from A (1, 0, 1) to B (2, 1, 2) along St.Line A B. Find the work done.	06	2	1,2,3	3
6c)	Solve $\frac{dy}{dt} + 2y + \int_0^t y dt = \sin t$ Given $y(0) = 1$	08	1	2,3	2
7a)	For the values of λ and μ , the following system of equations $2x + 3y + 5z = 9$, $7x + 3y - 2z = 8$, $2x + 3y + \lambda z = \mu$ will have (i) unique solution, (ii) no solution	06	3	1,2	6
7b)	Verify Green's theorem in the plane for $\oint_C (3x^2 - 8y^2) dx + (4y - 6xy) dy$ where C is the boundary of region defined by $y = \sqrt{x}$ & $y = x^2$.	06	2	1,2,3	5
7c)	Evaluate $\mathcal{L}^{-1} \left\{ \frac{s}{s^4 + 8s^2 + 16} \right\}$ using convolution theorem	08	1	2,3	7



**END SEMESTER November 2025 / RE - EXAM January 2026**

Program: Electrical

S. Y. B. Tech Control Systems
Duration: 03 hours

6/1/25

Course Code: BS-BTE301

Maximum Points: 100

Course Name: Laplace transform Vector calculus & Linear algebra

Semester: III

Notes: 1) Attempt any 5 out of 7 questions

2) Use of non-programmable calculator is allowed.

Q.No.	Questions	Points	CO	BL	Mod No.
1a)	Find a unit vector normal to the surface $xy^3z^2 = 4$ at point $(-1, -1, 2)$	06	2	1,2	3
1b)	Find the rank of $\begin{bmatrix} 2 & 3 & -1 & -1 \\ 1 & -1 & -2 & -4 \\ 3 & 1 & 3 & -2 \\ 6 & 3 & 0 & -7 \end{bmatrix}$	06	3	1,2,3	6
1c)	Solve $y'' + y = t$ Given $y(0) = 1$ $y'(0) = -2$ using laplace transform	08	1	2,3	2
2a)	Solve $2x - y + z + w = 0$ $x - y - w = 0$ $x + 2z + 2w = 0$	06	3	1,3	6
2b)	In usual notations prove that $\text{Divgrad } r^n = n(n+1)r^{n-2}$	06	2	1,2,3	7
2c)	Prove that: $\mathcal{L}^{-1} \left\{ \frac{1}{(s^2 + a^2)^2} \right\} = \frac{1}{2a^3} (\sin at - at \cos at)$ using convolution theorem	08	1	1,3	1



Bharatiya Vidya Bhavan's
SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
Munshi Nagar, Andheri (W) Mumbai - 400058



END SEMESTER November 2025 / RE - EXAM January 2026

3a)	Verify Divergence Theorem for $\vec{F} = 4x\hat{i} - 2y^2\hat{j} + z^2\hat{k}$ taken over the bounded by the cylinder $x^2 + y^2 = 4, z = 0, z = 3$	10	2	2,3	5
3b)	Verify Cayley-Hamilton's theorem for $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ & hence obtain A^{-1} .	10	3	2,3	7
4a)	Find the values and eigen vectors of the matrix. $A = \begin{bmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{bmatrix}$	06	3	1,2	7
4b)	Evaluate: $\mathcal{L}^{-1} \left\{ \log \left \frac{s^2 + b^2}{s^2 + a^2} \right \right\}$	06	1	2,3	2
4c)	Verify Stoke's theorem for the vector field $\vec{F} = (x^2 - y^2)\hat{i} + 2xy\hat{j}$ over the box bounded by planes $x = 0, x = a, y = b, z = C$ if the face $z = 0$ is cut.	08	2	1,2,3	5
5a)	In usual notations prove that $\text{Divgrad } r^n = n(n+1)r^{n-2}$	06	2	1,3	3
5b)	Evaluate $\mathcal{L} \{ \sin 2t \sin 4t \sinh t \}$	06	1	2,3	1
5c)	If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, Find two non singular matrices P and Q such that $PAQ = I$. Hence find A^{-1} .	08	3	1,3	6



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SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)
 Munshi Nagar, Andheri (W) Mumbai - 400058



END SEMESTER November 2025 / RE - EXAM January 2026

6a)	Define a unitary matrix. if $N = \begin{bmatrix} 0 & 1+2i \\ -1+2i & 0 \end{bmatrix}$ is a matrix, then show that $(I-N)(I+N)^{-1}$ is a unitary matrix, where I is an identity matrix.	06	3	2,3	6
6b)	Find the Laplace transforms of f(t), where $f(t) = \begin{cases} t, & 0 < t < 4 \\ 5, & t > 4 \end{cases}$	06	2	1,2,3	3
6c)	Prove that $\vec{F} = (y^2 \cos x + z^3)\hat{i} + (2y \sin x - 4)\hat{j} + (3xz^2 + 2)\hat{k}$ is conservative and find the scalar potential Φ .	08	1	2,3	2
7a)	For what values of 'a' and 'b' the equations $x + 2y + 3z = 4$ $x + 3y + 4z = 5$ $x + 3y + az = b$ Have v) No solution vi) A unique solution Infinite number of solutions	06	3	1,3	6
7b)	Apply Green's thm to evaluate $\oint_C (y - \sin x)dx + \cos x dy$ where C is the plane triangle enclosed by the lines $y = 0, x = \pi/2$ & $y = \frac{2x}{\pi}$.	06	2	2,3	5
7c)	Prove that: $\mathcal{L}^{-1} \left\{ \frac{1}{(s^2 + a^2)^2} \right\} = \frac{1}{2a^3} (\sin at - at \cos at)$ using convolution theorem	08	1	1,2,3	7

