Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai – 400058

ENDSEMESTER EXAMINATION/~~RE-EXAMINATION~~ DEC24-~~JAN~~25

Program: ELECTRICAL **Duration: 03 Hours**

Course Code: BS-BTE301 **Maximum Points:100**

Course Name: Laplace vectorcalculus & linearalgebra **Semester: III**

- **Attempt any five out of seven questions**
- **Use of scientific calculator is allowed.**

QNO.	QUESTION	POINTS	CO	BL	Module No.
Q1a)	Prove that $\nabla\left(r^2e^r\right)=(r+2)e^r\vec{r}$	06	2	2	3
Q1 b)	Using convolution theorem evaluate $L^{-1}\left\{\frac{s}{(s^2+4)(s^2+1)}\right\}$	06	1	3,5	2
Q1 c)	Verify Divergence Theorem for $\vec{F}=4x\hat{i}-2y^2\hat{j}+z^2\hat{k}$ taken over the bounded by the cylinder $x^2+y^2=4, z=0, z=3$	08	2	1	5
Q2a)	Test for consistency and solve $x-2y+3t=2$ $2x+y+z+t=-4$ $4x-3y+z+7t=8$	06	3	2	6
Q2b)	Find the values of constants λ and μ so that the surfaces $\lambda x^2-\mu yz=(\lambda+2)x$ and $4x^2y+z^3=4$ may intersect orthogonally at the point $(1,-1,2)$	06	2	2	3
Q2c)	Evaluate by Green's thm $\oint_c e^{-x}(\sin y\,dx+\cos y\,dy)$ where C is the rectangle with vertices (0, 0), (π/0) (π, π/2) & (0, π/2).	08	2	3	4
Q3 a)	Find L $\left[\frac{d}{dt}\left(\frac{1-\cos 2t}{t}\right)\right]$	06	1	2	1
Q3 b)	Find a unit vector normal to the surface $x^2y+2xz=4$ at point $(2,-2,3)$	06	2	2	3
Q3c)	Find the eigen values and eigenvectors of the matrix	08	3	4,5	7

ENDSEMESTER EXAMINATION/RE-EXAMINATION DEC24-JAN25

	$A=\begin{bmatrix}1 & 2 & 0\\ 2 & 1 & -6\\ 2 & -2 & 3\end{bmatrix}$				
Q4 a)	Show that the matrix $A=\begin{bmatrix}1 & -6 & -4\\ 0 & 4 & 2\\ 0 & -6 & -3\end{bmatrix}$ is similar to a diagonal matrix. Also find the transforming matrix and diagonal matrix.	06	3	3	7
Q4 b)	Prove that $\frac{\bar{a}\times\bar{r}}{r^n}$ is a solenoidal vector.	06	2	2	3
Q4 c)	Solve $y''+y=t$ using laplace transform Given $y(0)=1$ & $y'(0)=-2$	08	1	3	2
Q5 a)	Evaluate: $L^{-1}\{cot^{-1}(1+s^2)\}$	10	1	2	2
Q5 b)	If $\vec{F}=(x+2y+az)\hat{i}+(bx-3y-z)\hat{j}+(4x+cy+2z)\hat{k}$ is conservative then find values of a,b,c & hence find its scalar potential Φ.	05	2	2	4
Q5 c)	Find the characteristic equation of the matrix $A=\begin{bmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{bmatrix}$. Verify Cayley – Hamilton theorem	08	3	2	7
Q6a)	Using laplace transforms Prove that $\int_0^\infty \frac{\sin 2t+\sin 3t}{te^t}dt=\frac{3\pi}{4}$	06	1	4	2
Q6 b)	Find non – singular matrices P and Q such that P A Q is in normal form $A=\begin{bmatrix}1 & 2 & -1 & 2\\ 2 & 5 & -2 & 3\\ 1 & 2 & 1 & 2\end{bmatrix}$ Hence find rank of A.	06	3	3	6
Q6 c)	Verify Stoke's theorem for the vector field $\vec{F}=(2x-y)\hat{i}-yz^2\hat{j}-y^2z\hat{k}$ over the upper half surface of $x^2+y^2+z^2=1$ bounded by its projection on the XY-plane.	08	2	3	5
Q7 a)	Determine the value of 'p' such that the rank of matrix is 3	06	3	3	6

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	$A=\begin{pmatrix} 1 & 1 & -1 & 0 \\ 4 & 4 & -3 & 1 \\ p & 2 & 2 & 2 \\ 9 & 9 & p & 3 \end{pmatrix}$				
Q7 b)	Show that $\int_C \vec{F}.\overrightarrow{dR}=3\pi$ given that $\vec{F}=z\hat{i}+x\hat{j}+y\hat{k}$ and C being the arc of curve $\vec{r}=\cos t\,\hat{i}+\sin t\,\hat{j}+t\,\hat{k}$ from $t=0$ to $t=2\pi$	06	2	2	5
Q7c)	Solve using Laplace $\frac{dy}{dt}+2y+\int_0^t y\,dt=\sin t$ Given $y(0)=1$	08	1	3,5	5

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Munshi Nagar, Andheri (West), Mumbai – 400058

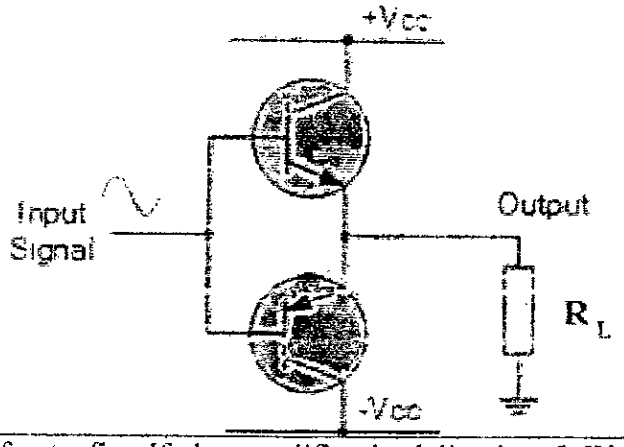
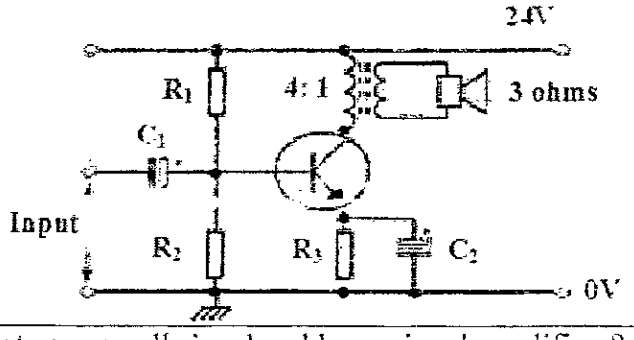
End Sem/~~Re Exam~~ Dec 2024

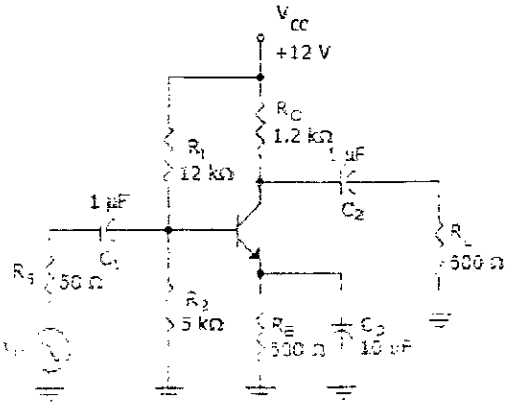
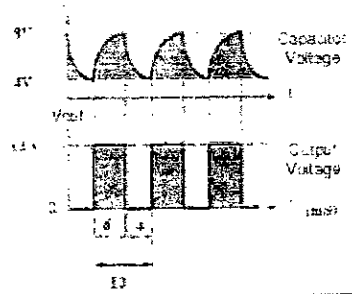
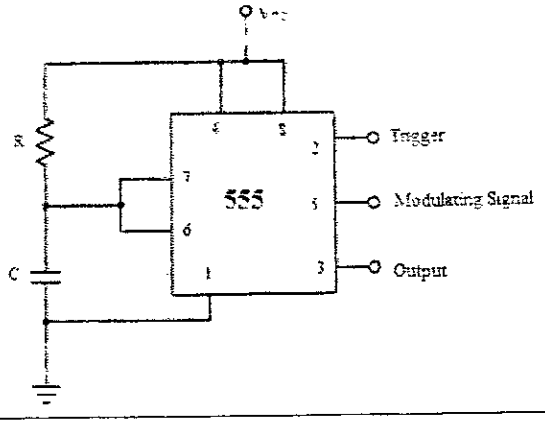
Program: Electrical Engineering | **Duration: 3 Hour**

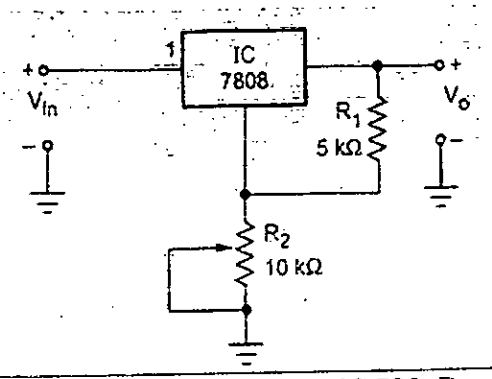
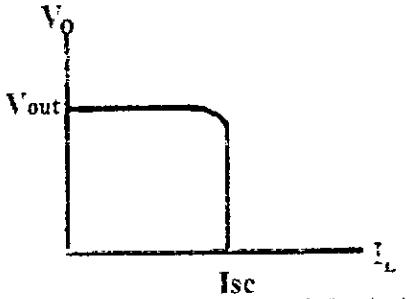
Course code: PC-BTE301 | **Maximum Marks: 100**

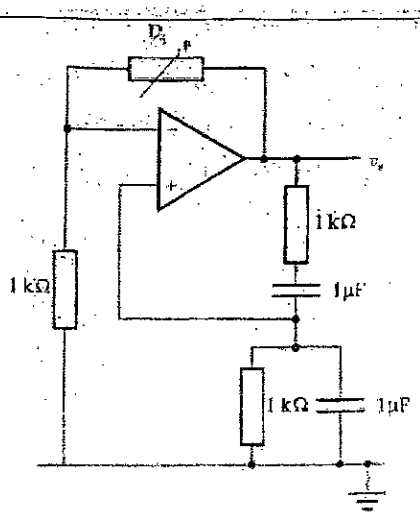
Name of the Course: Analog Circuits | **Semester: III**

Solve any five questions out of seven.

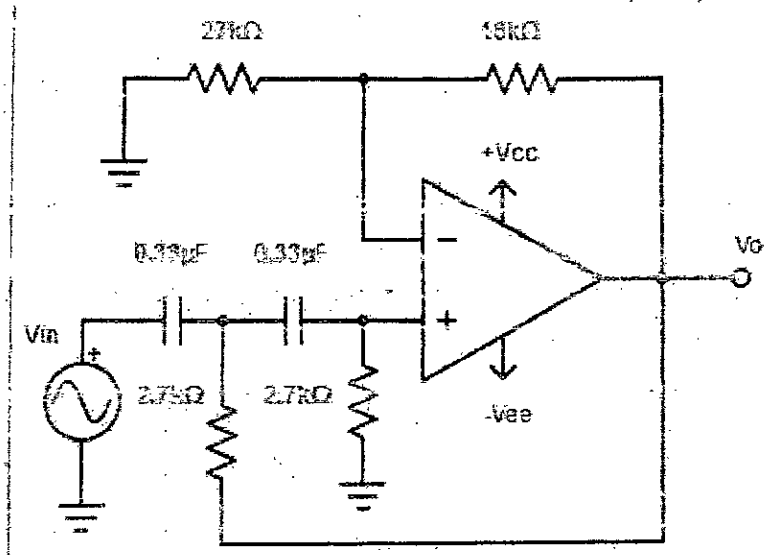
Q.		Pts	CO	BL	Module
1A	Identify the circuit. Draw output waveform with respect to the input waveform. Modify and redraw the circuit so that output is exact replica of the input. Explain the modification.	10	1	2	1
					
B (i)	Refer to fig. If the amplifier is delivering 5 W of audio power to the loudspeaker, what will be the approximate RMS voltage across the transformer primary? 	4	1	3	1
(ii)	What is the difference between small signal and large signal amplifiers?	6	1	1	1
2 A	Draw the circuit diagram showing all the details. (potential divider bias with R_E bypassed). Given: V_{cc} = 10V, C_{be} = 40pF, C_{bc} = 5pF, C_{ce} =2pF, C_{wi} = 8pF, C_{wo} = 6pF, C_S = 1μF, C_E = 10 μF, C_C = 0.22μF, h_{fe} = 100,	10	1	3	2

	h_{ie} = 4.4KΩ , h_g = 0.001Ω, R_1 = 18 KΩ, R_2 = 4.7KΩ, R_C = 1.5KΩ, R_L = 5KΩ , R_E = 1.2 K Ω . (i) Determine lower cutoff frequency due to Cc (ii) Determine the equivalent capacitance seen from o/p at high frequency.				
B (i)	Refer to this figure. The output voltage at lower cutoff frequency f_{CL} is = 12 mV. What is the output voltage at the midpoint frequency? Explain with the help of frequency response. 	5	1	3	2
(ii)	Determine the bandwidth of the opamp if GBP 1 MHz and the gain is 100dB. If now gain changes to 80 dB what will be the new BW?	5	1	3	2
3 A	Given below are the waveforms for application of IC 555. Identify the application. Draw the circuit diagram specifying Vcc and values of the componenets used. 	10	2	3	3
B	Explain with the help of neat waveforms the application of the IC 555 with respect to the following circuit. 	10	2	3	3

4A	Explain following performance parameters of 7805.	8	3	1	4
(i)	(i) Line regulation (ii) Load Regulation (iii) Ripple rejection				
(ii)	Switching regulators are more efficient than linear regulators. T/F. Justify	2	3	5	4
B (i)	Calculate the output voltage Vo 	4	3	3	4
(ii)	The graph shows output characteristics Vo Vrs. I_L for regulator IC 723. Draw the part of the circuit with Rsc and explain the same. 	6	3	1	4
5A (i)	Voltage gain of an amplifier without feedback is 80 dB. It decreases to 40dB with feedback. Determine the value of feedback factor.	3	4	3	6
(ii)	The distortion in an amplifier is found to be 3 % when the feedback ratio of negative feedback amplifier is 0.04. When the feedback is removed, the distortion becomes 15 %. Find the open loop and closed loop gain.	4	4	3	6
(iii)	An amplifier has a mid-frequency gain of 100 and a bandwidth of 200 kHz. What will be the new bandwidth and gain, if 5 % negative feedback is introduced?	3	4	3	6
B	State whether following statements are true or false. Justify your answer.	10	4	5	6
(i)	Input impedance increases in case of current series feedback				
(ii)	Negative feedback is employed in the amplifiers in spite of reduction in gain.				
6A	Draw the circuit diagram of RC phase shift oscillator. Explain its working.	10	5	3	-
B	Determine value of R for the circuit to work as oscillator. Explain the working of the circuit. Is it using both positive as well as negative feedback? Explain.	10	5	3	-



7A (i)	(i) Gain (ii) easy to tune (iii) use of inductors (iv) isolation all are the advantages of an active filter. Is the statement correct? If not modify. Explain the same.	5	5	1	5
(ii)	Identify the circuit and calculate the cut-off frequency.	5	5	3	5
B	Match the gain of the filter with the frequencies in the low pass filter and with the help of neat circuit diagram, frequency response and the gain expression explain the same.	10	5	2	5



Frequency	Gain of the filter
1. $f < f_H$	i. $V_O/V_{in} \cong A_F/\sqrt{2}$
2. $f=f_H$	ii. $V_O/V_{in} \leq A_F$
3. $f>f_H$	iii. $V_O/V_{in} \cong A_F$

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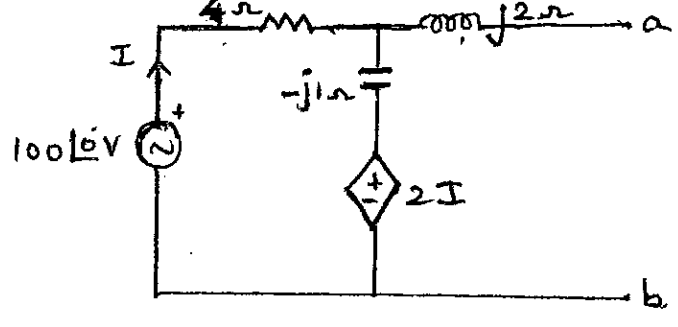
END SEM/~~Re-exam~~ AY (24-25) Dec.24 / ~~Jan 25~~

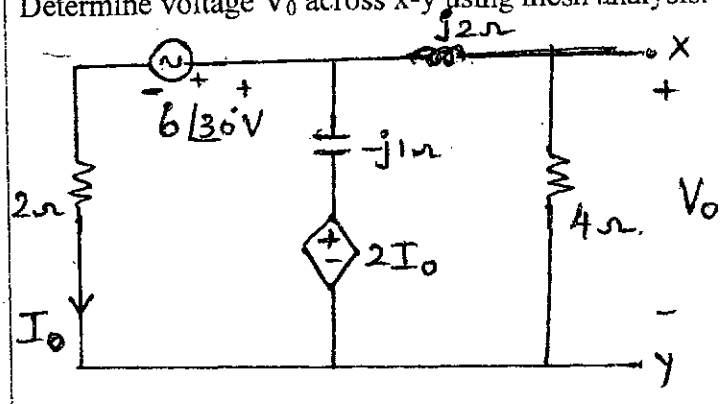
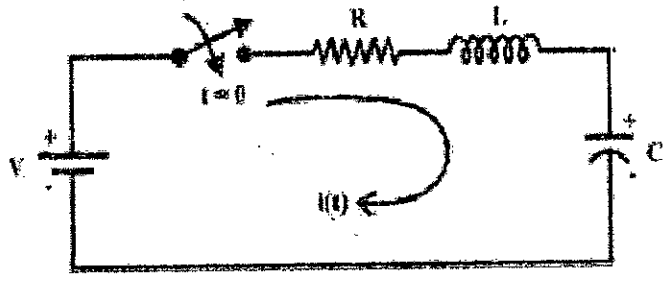
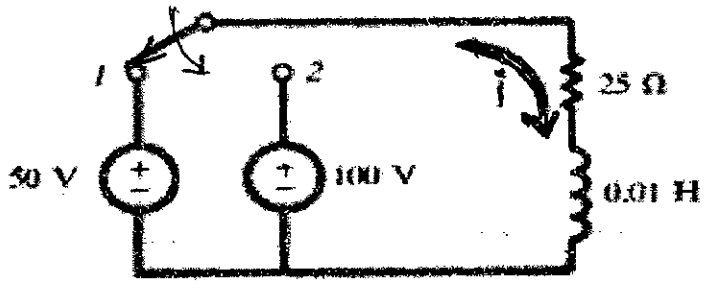
Program: SY Btech., Electrical Engineering **Duration:3 hours**

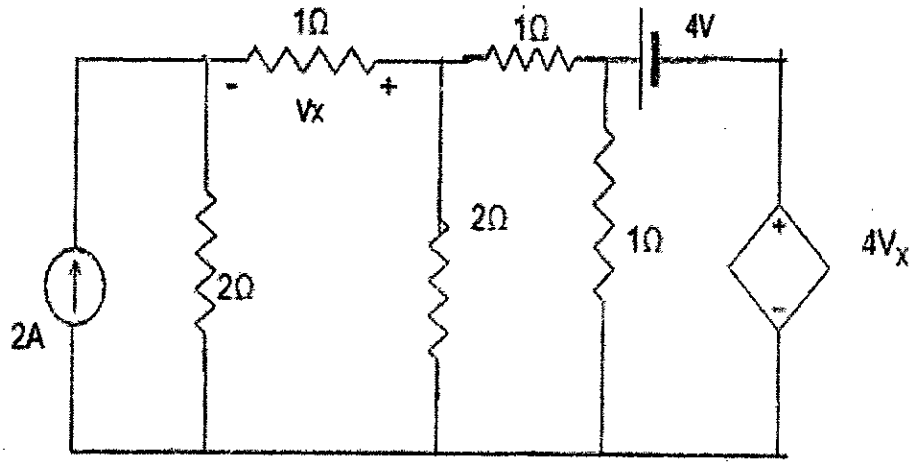
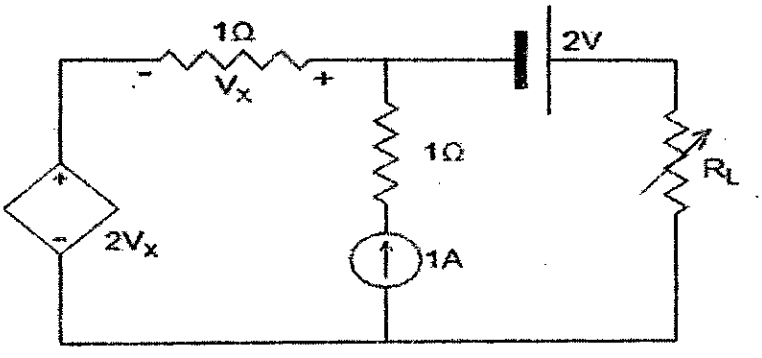
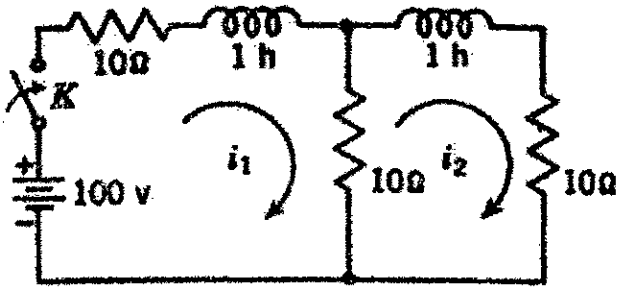
Course Code: PC-BTE302 **Maximum Points:100**

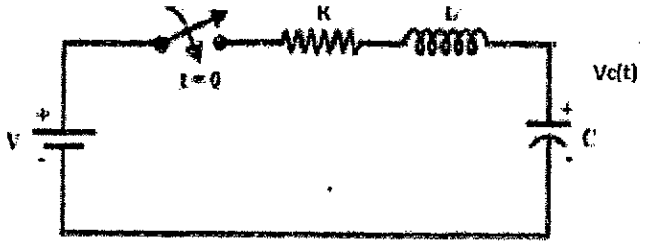
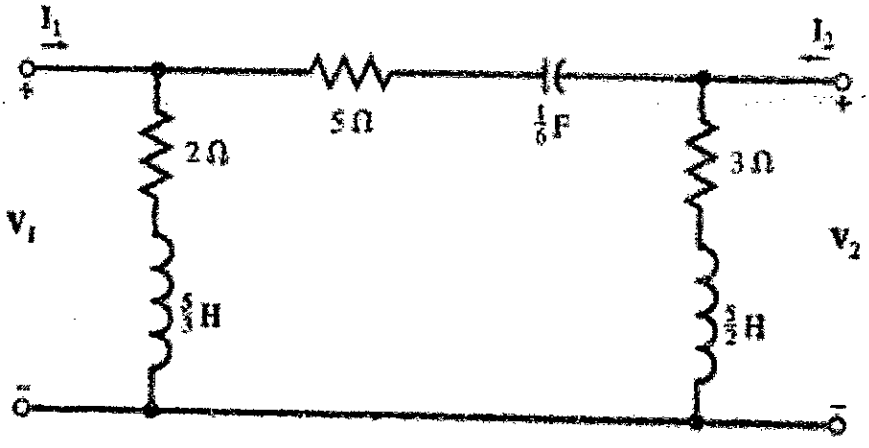
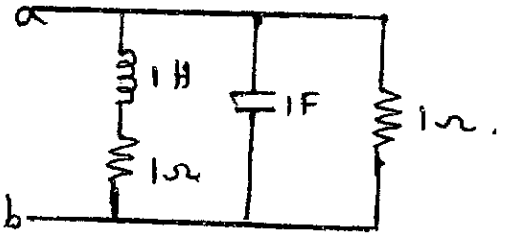
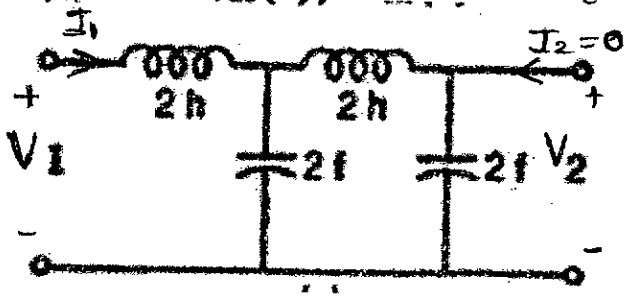
Course Name: Electrical Networks **Semester:III**

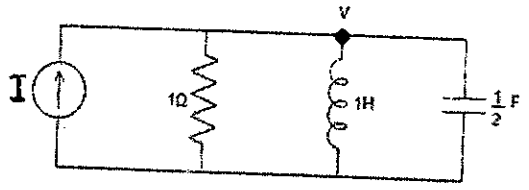
- Attempt any FIVE questions out of SEVEN questions.
- Answers to all sub questions should be grouped together.
- Figures to the right indicates full marks.

Q.No	Questions	Points	CO	BL	Module
Q1.(a)	Derive ABCD parameters for two port network.	5	2	3	4
b)	State Maximum power transfer theorem .(load impedance has variable resistance and variable reactance).	2	1	2	2
c)	A coil having a resistance of 10Ω and inductance of 1H is switcjhed on to a direct voltage of 100V. Calculate the rate of change of current at the instant of closing the switch and when t=L/R.Also find the steady state value of the current and time at which the drops across R and L are the same.	5	2	3	4
d)	A network function is given by $P(s)=\frac{s(s+1)}{(s+2)(s^2+2s+2)}$ Obtain the pole-zero diagram.	4	3	3,4	6
e)	Draw the Laplace equivalent circuits for R,L,C taking into account the initial conditions.	4	2	2	5
Q2.(a)	Find the Thevenins equivalent circuit across the terminal a-b . 	10	1	3	2

2b)	Determine voltage V_0 across x-y using mesh analysis. 	10	1	3	2
Q3(a)	In the network shown the switch is closed at t=0. Assume no initial conditions, obtain the expression for i(t) at t>0 (time domain), V=100V, R=20Ω, L=0.05H, C=20μF. 	10	2	3,4	4
3b)	In the network switch is in position 1 for a long enough to establish steady state condition and at t=0 it is moved to position 2 .Determine the current i i(t) for t>0.(time domain). 	10	2	4	4

Q4(a)	Find the node voltages. 	10	1	3	1
4b)	For the given network calculate the maximum power that may be dissipated in the resistor R_L 	10	1	3	1
Q5.(a)	In the network determine the current $i_1(t)$ for t> 0when switch is closed at t=0..(Using Laplace transform) 	10	2	3 4	5

5(b)	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) R=2Ω, L=1H,C=1F. 	10	2	3,4	5
Q6.(a)	Determine Y parameters for the network shown in fig. 	10	3	3	7
6b)	Derive Z parameters in terms of Y parameters.	6	3	2	7
6c)	Find driving point impedance of the network and draw the pole-zero plot. 	4	3	3	6
Q7a)	Determine the voltage transfer function V_2/V_1 for the given network. 	10	3	3	6

b)	Obtain the expression of an inductor current if it is connected to dc voltage source through a switch instantaneously and having a resistor in series. Assume initial conditions to be zero. Draw the profiles of V_R, V_L and I_L. Obtain the values of current for 5^{th} time constant.	8	2	2	4
c)	Write the second order differential equation for the given circuit. 	2	2	3	3

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End Sem / ~~Re-Exam~~ – December/~~January~~ 2024-25 Examinations

Program: Electrical

Course Code: PC-BTE303

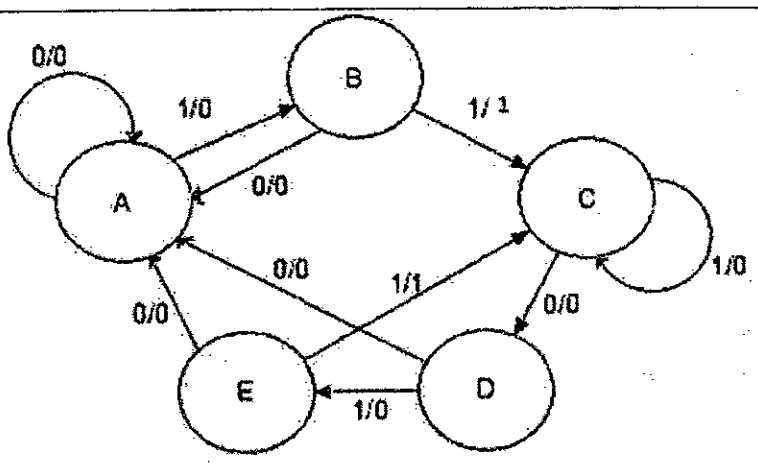
Course Name: Digital Electronics

Duration: 3 hours

Maximum Points: 100

Semester: III

- Answer any FIVE out of SEVEN
- Make suitable assumptions wherever necessary

Q.No.	Questions	Points	CO	BL	Module No.
1a.	 Obtain reduced state diagram for the above given state diagram using the state reduction technique.	08	3	3	7
1b.	Explain working of Master slave JK flip flop along with the timing diagram for toggle mode.	12	2	2	4
2a..	Discuss PLA memory	10	4	2	6
2b.	Explain working of TTL NOR GATE.	10	4	2	6
3a.	Implement 16:1 Mux using 4:1 Mux (5 nos.) and hence implement the following equation $f(P,Q,R,S) = \Pi M(0,2,3,7,8,9,11,15)$.	10	2	3	3

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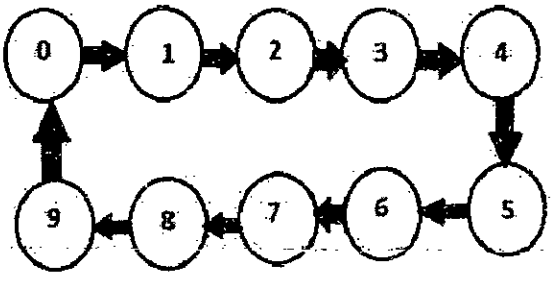
End Sem / ~~Re-Exam~~ – December/~~January~~ 2024-25 Examinations

3b.	Design the following counter using D flip flops 	10	2	3	4
4a.	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	6
4b.	Design a sequence generator to generate the sequence 11001110....using a left shift register.	10	2	3	5
5a.	Design a 9 bit comparator using IC 7585.	10	2	3	3
5b.	Design a XS-3 to BCD code converter	10	2	3	2
6a.	Design a 9 bit odd Parity generator using IC 74180.	10	2	3	3
6b.	Explain different types of Flip Flops with their truth table as well as excitation table. Explain the importance of Clear and Preset inputs.	10	2	2	4
7a.	Explain Mealy machine with example	10	3	2	7
7b.	Perform the following i. $(23)_{10} = (?)_8$ ii. $(100110)_2 = (?)_{gray}$ iii. $(ADC)_{16} = (?)_{BCD}$ iv. The receiver receives the code word 1010111. Find out if there is any error or not and correct if error is present. v. $(37)_{10} - (?)_{XS-3}$	10	1	3	1

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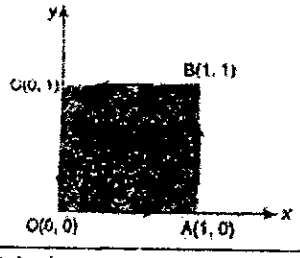
END SEM / ~~RE-EXAM~~ EXAMINATION DEC./~~JAN~~. 2024-25

Program: SY BTECH Electrical | **Duration: 3 Hours**

Course Code: PC-BTE304 | **Maximum Points:100**

Course Name: Electromagnetic Field and Waves | **Semester: III**

Notes: [a] All questions are compulsory,
[b] Assume suitable data if necessary and mention it accordingly.
[c] Draw neat diagrams wherever necessary.

Q. No	Questions	Points	CO	BL	Module No
1					
1A	Transform given Electric Field (E) and Magnetic field (H) into Cylindrical Co-ordinates. [i] $\bar{E} = 10\boldsymbol{a_x} - 8\boldsymbol{a_y} + 6\boldsymbol{a_z}$ at point P(10, -8, 6) [ii] $\bar{H} = (2x + y)\boldsymbol{a_x} - (y - 4x)\boldsymbol{a_y}$ at point Q(ρ, ϕ, z)	6	1	2	1
1B	Given vector $\bar{F} = x^2 y\,\boldsymbol{a_x} + 2xy^2\boldsymbol{a_y}$, estimate circulation of F along a closed path OABC as shown in figure below. Verify the result using Stoke's Theorem. 	8	1	3	1
1C	A charge of -0.3 μC is located at A(25, -30, 15) (in cm) and a second charge of 0.5 μC is at B(-10, 8, 12)cm. Evaluate E at (i) the origin, (ii) P(15, 20, 50) cm.	6	1, 2	3	2
2					
2A	[i] Explain with significance Divergence; Divergence Theorem. [ii] Vector field is described by $\bar{F} = yxz\,\boldsymbol{a_x} - y^2\boldsymbol{a_y} + yz\,\boldsymbol{a_z}$ and S is the surface of the unit cube bounded by $x = 0, x = 1; y = 0, y = 1; z = 0, z = 1$. Evaluate the right-hand side part (volume integral) of Divergence Theorem.	4 4	1	3	2
2B	Two point charges -4 μC and 5 μC are located at (2, -1, 3) and (0, 4, -2) respectively. Determine the potential at (1, 0, 1) assuming zero potential at infinity.	4	1, 2	3	2
2C	Derive electrostatic boundary conditions for Dielectric-Dielectric interface. Justify the significance of boundary conditions.	8	1, 4	3	3
	OR				
2C	Determine the capacitance of parallel plate capacitor having mica dielectric, relative permittivity = 6, a plate area of 10 in.^{2} and a separation of 0.01 in.(inches)[1inch = 0.0254m]. Also, derive the expression for Energy stored in Capacitor.	8	1, 4	4	3

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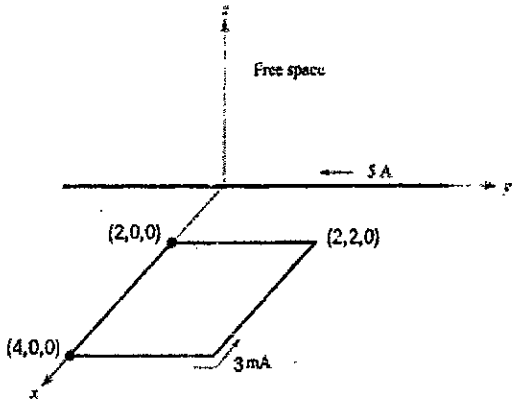
3					
3A	Derive the Continuity equation of Current in both differential and integral form. Elaborate on the concepts used and the conclusion drawn out of it.	6	2	3	3
3B	[i] Estimate the value of $\overline{H}$ at P(2,3,6) if there is current filament carrying 16 mA along Z-axis. [ii] Repeat [i] if the current filament is passing through $x = -1, y = 2$ parallel to Z-axis.	8	1, 3	3	4
3C	State Biot-Savart's Law. Thus, express magnetic field in terms of different current configurations.	6	1, 3	2	4
4					
4A	With the help of neat diagram, derive equation of magnetic field intensity at some point because of a straight current carrying conductor of specific length placed along z-axis.	6	1, 4	3	4
4B	Explain Lorentz Force Equation. Also, discuss about Torque associated with closed current carrying circuit.	6	1, 3	2	5
4C	Elaborate about Force on differential Current element. Square loop of wire exist in z = 0 plane carrying 3mA in the field of an infinite filament on the y-axis as shown in figure. Determine the total Force on the loop. Elaborate the equation used. 	8	1, 3	4	5
	OR				
4C	Given that $\overline{H} = 0.2z^2 a_x$ for z > 0 and $\overline{H} = 0$ elsewhere, as shown in figure below. Determine $\oint H \cdot dL$ about a square path with side d, centered at (0, 0, z_1) in the y=0 plane where z_1 > d/2. Also, determine curl of H. Comment on the direction of the curl obtained.	8	1,3	4	4

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	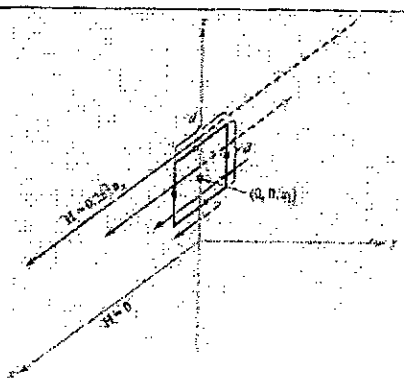				
5					
5A	Discuss Faraday's law for production of EMF along with Transformer and Generator action. Derive Maxwell's equations related to this context.	8	2	4	6
5B	An electric field in free space is given as $\vec{E} = 1000\cos(10^8 t - \beta y)\,\widehat{a_z}$ V/m Determine (i) phase constant, (ii) wavelength, (iii) magnetic field intensity at P(0.2, 2.5, 0.4) at 10nS.	8	4	4	7
5C	Explain the concept along with significance of Skin Depth and Loss Tangent	4	4	2	7

END

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Program: S.Y.B. Tech **Duration: ~~30~~ 120 Min**

Course Code: VE-BTE001 **Maximum Points: 50**

Course Name: Environmental Science and Sustainability **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.

Q.No.	Questions	Points	CO	BL	Module No.
Q1					
a	What is the scope of environmental studies? Write a short note	5	2	1	1
b	Write a brief note on the multidisciplinary nature of environmental studies	5	2	1	1
Q2					
a	Describe the composition of air in brief	5	2	3	1
b	Explain the various sources of water and their classification.	5	1	2	1
Q3					
a	What are the widespread and severe impacts of water pollution	5	1	1	1
b	Describe the chemical processes leading to the formation of the ozone hole. Include the chemical reactions involved, the causes of ozone depletion	5	3	3	2
Q4					
a	What are the key steps involved in municipal solid waste management	5	1,2	1	2
b	What are the environmental benefits of wind energy	5	2	1	2
Q5					
a	What does the future hold for geothermal energy	5	2,3	1	3
b	What are the three pillars of sustainability, and why are they essential for achieving a balanced and sustainable future	5	1	1	3

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Q.No.	Questions	Points	CO	BL	Module No.
Q6					
a	What are the mechanics behind wind power	5	1,3	1	2
b	What is sustainable transportation, and why is it important for environmental and societal well-being	5	2,3	1	3
Q7					
a	What are carbon credits and the carbon credit market	5	2,1	1	4
b	Explain benefits of carbon credits	5	3	2	4