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SARDAR PATEL COLLEGE OF ENGINEERING

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

Re Examinations (For Academic Year 2017-18)- January 2020

Program: Electrical Engineering
Course Code: BTE201
Course Name: Engineering Mathematics III

Duration: 3 hours
Maximum Points: 100
Semester: III

Instructions:
1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Answers to sub questions should be grouped together.

Q.No.	Questions	Points
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^t}\right)dt=\frac{3\pi}{4}$	6
(b)	Find the image of the rectangular region bounded by the lines $x=0$, $x=1$, $y=0$, $y=2$ in the z plane under the transformation $w=z+(2-i)$. Draw the sketch.	6
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{-3t}erf(4\sqrt{t})\}$	6
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6
(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6
(c)	Find Fourier Series Expansion of following function in the interval $(0,2\pi)$ $f(x)=\begin{cases} x & 0\le x\le \pi \\ 2\pi-x, & \pi\le x\le 2\pi \end{cases}$	8
4(a)	Find the image of the circle $\lvert z-1\rvert=1$ under the transformation $\frac{1}{z}$	6
(b)	Find Half Range Fourier sine Series of $f(x)=lx-x^2,\quad 0<x<l$	6
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8
5(a)	Show that the set $S=\{\cos x,\ \cos 2x,\ \cos 3x,\cdots\}$ is Orthogonal over $(0,2\pi)$	6
(b)	If $A=\begin{bmatrix} 2 & 3 \\ -3 & -4 \end{bmatrix}$, using Cayley Hamilton Theorem, find A^{100}	6
(c)	Evaluate (i) $L^{-1}\left\{\frac{2s^2+5s+2}{(s-1)^3}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\frac{4}{s^2}\right)\right\}$	8
6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6

(b)	Find Eigen values of the matrix $A=\begin{bmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}$	6
(c)	Find the bilinear transformation which maps the points $2,\ i,\ -2$ of $z-$plane onto $1,\ i,\ -1$ of $w-$plane respectively	8
7(a)	Show that the transformation $w=\dfrac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6
(c)	Evaluate $L^{-1}\left\{\dfrac{s}{s^4+4}\right\}$	8

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Sardar Patel College of Engineering
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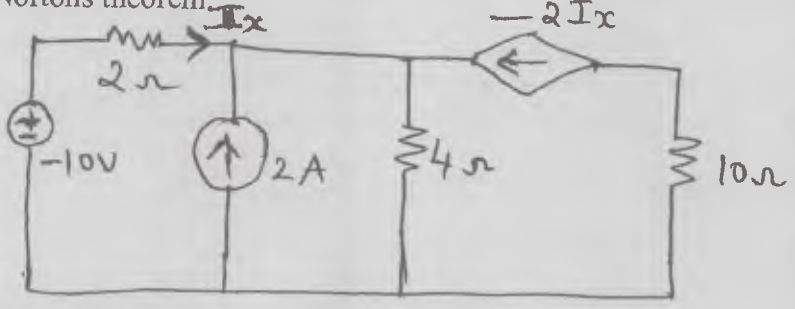
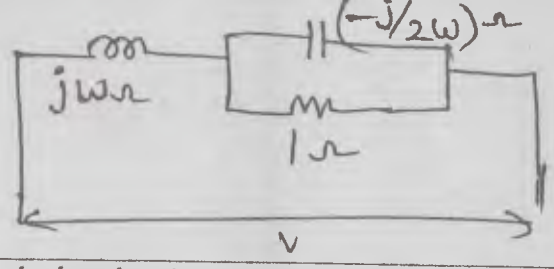
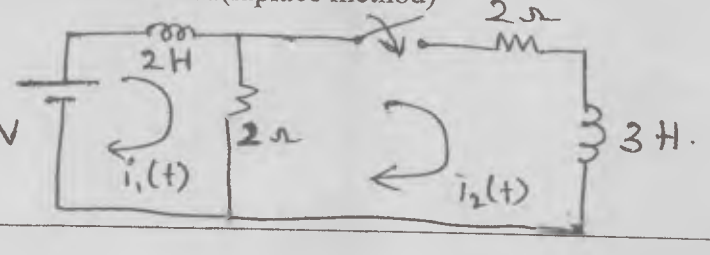
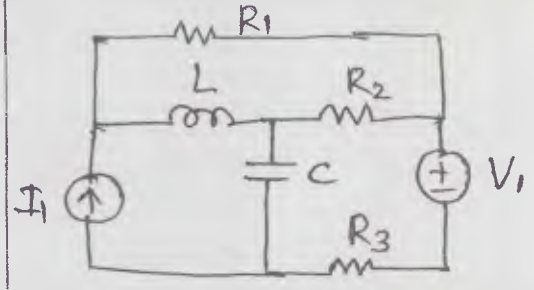
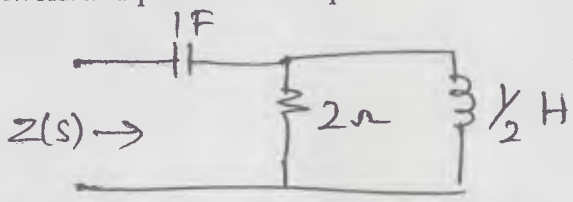
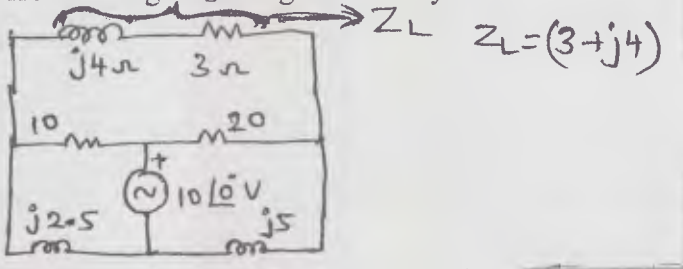
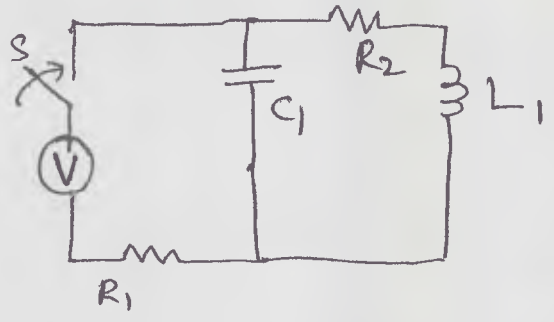
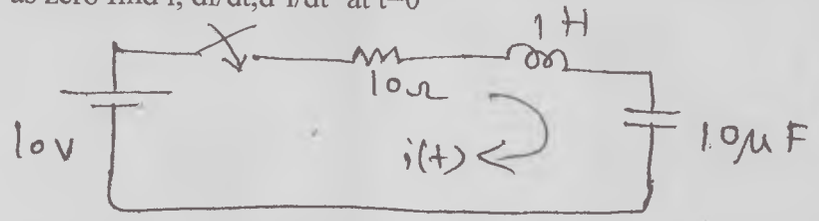
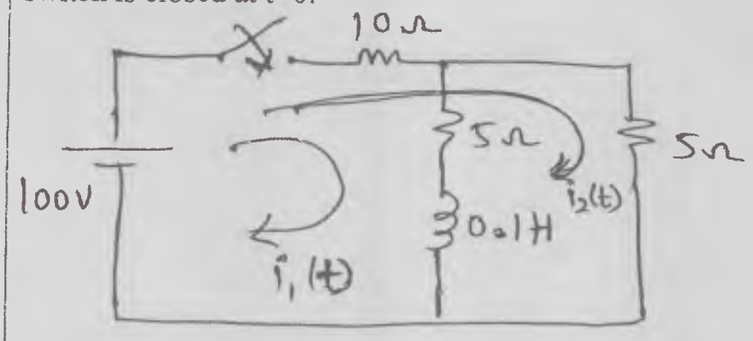
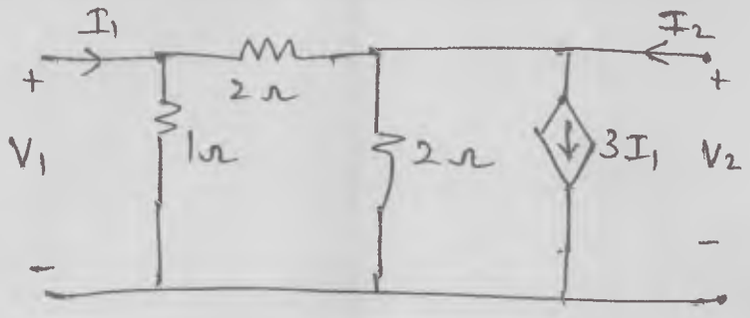
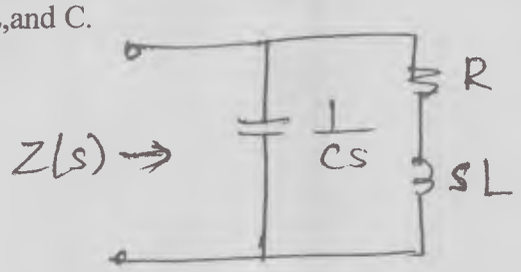
Reexam, Jan 2020

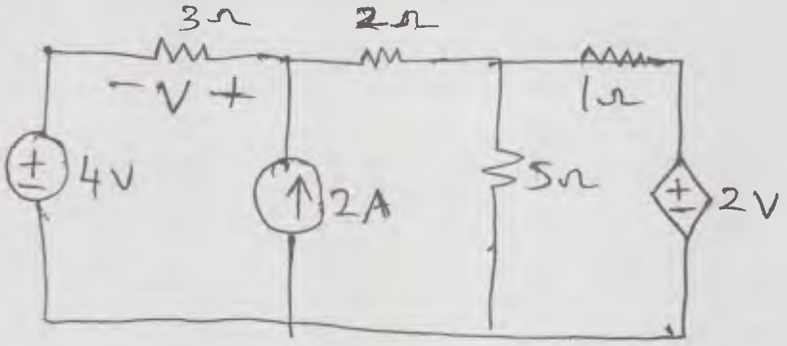
Program: : Electrical Engineering
Course Code : PC-BTE302
Name of the Course: Electrical Networks
Note: Answer any 5 questions…
Assume suitable data if missing

Duration:3 hours
Max points: 100 marks
Semester: III

QN		Marks	CO	BL	PI
1a.	For the circuit through the 2ohm resistor in the network by Nortons theorem. 	10	2	3	2.1.3
b.	Find the frequency at which the circuit will be at resonance. 	4	1	3	2.1.3
c	Justify whether the given polynomial is Hurwitz $P(s)=s^4+s^3+2s^2+3s+2$ $P(s)=s^5+s^3+s$	6	4	6	2.4.1
2a.	For the network shown,the switch is closed at t=0,the steady state being reached before t=0.Determine the current through the inductor of 3H.(laplace method) 	8	3	3	1.3.1 2.1.3

b.	For the given network draw oriented graph, write down the f-tie set matrix and f-cutset matrix and incidence matrix. 	8	1	5	2.1.3
c)	Find the poles and zeros of the impedence of the given network and plot them on s plane 	4	2	3	2.1.3
3a	Check whether the function $Z(s)=\frac{s^3+6s^2+7s+3}{s^2+2s+1}$ is a positive real function.	8	3	5	1.3.1
b.	Find the current through Z_L using mesh analysis 	12	1	3	2.1.3
4a	Draw the dual of the given network. 	5	2	5	2.1.3

b	In the network switch is closed Assuming all initial conditions as zero find i, $di/dt, d^2i/dt^2$ at $t=0^+$ 	10	4	5	2.1.3
c	In the case of a series RC circuit excited by a DC supply V derive equation for transient current with initial conditions.	5	3	3	2.1.3
5a	In the network determine currents $i_1(t)$ and $i_2(t)$ when the switch is closed at t=0. 	10	2	3	2.1.3
b	Determine the Y and Z parameters for the given network 	10	4	3	1.3.1
6a	A network is shown in fig.The poles and zeros of the driving point function Z(s) of this network are at the following places. Poles at $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$,Zero at -1.If Z(j0)=1,Find the values of R,L,and C. 	10	4	4	1.3.1

b.	Find V_0 using the principle of superposition theorem. 	10	1	3	2.1.3
7a.	Realize the Foster I and II forms of the LC impedance function $Z(s)=\frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$	12	4	5	2.1.3
b	Synthesize the following LC impedance function in Cauer 1 and II form $Z(s)=\frac{10s^4+12s^2+1}{2s^3+2s}$	8	3	3	2.1.3

Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

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RE Exam – January 2020 Examinations

Program: Electrical
Course Code: PC-BTE303
Course Name: Digital Electronics

Duration: 1 hour
Maximum Points: 20
Semester: III

- Attempt **any 5** out of 7 questions
- Make suitable assumptions wherever necessary

Q.No.	Questions	Points	CO	BL	PI
1a.	The input to a combinational logic circuit is a 4 bit binary number. Design the circuit using minimum hardware whose output is valid BCD number.	10	2	6	3.2.2
1b.	Implement BCD to Seven Segment (common anode type) code converter	10	2	3	2.2.3
2a.	Design a controlled addition / subtraction circuit using IC 7483.	10	2	6	3.2.2
2b.	Explain what are the problems associated with asynchronous counter and how they can be overcome.	10	3	2	1.4.1
3a.	Do the following conversion: i. S-R flip flop to D flip flop ii. J-K flip flop to T flip flop	10	3	3	3.2.1
3b.	Explain the working of TTL NOR gate.	10	4	2	1.4.1
4a.	Implement the following $f(A,B,C,D) = \sum m(0,1,3,5,7,8,9,10,12,13,15)$ using 1. Single 2:1 Mux 2. Single 4:1 Mux	10	2	4	2.2.3
4b.	Explain with help of neat diagram Left shift register and Right Shift register.	10	3	2	1.4.1

5a.	Design a10 bit comparator using IC 7485.	10	2	6	3.2.2
5b.	Discuss the classification of memories	10	4	2	1.4.1
6a.	Design the following synchronous counter using the concept of bushing.	10	3	6	3.2.2
6b.	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. $(1111)_2 * (101)_2$	10	1	3	2.1.3
7a.	Suppose the receiver receives hamming code data as 1011110. Find out if there is any error or not and correct it if error is present.	10	1	4	2.2.3
7b.	Write short note on SOP and POS.	10	2	2	1.4.1

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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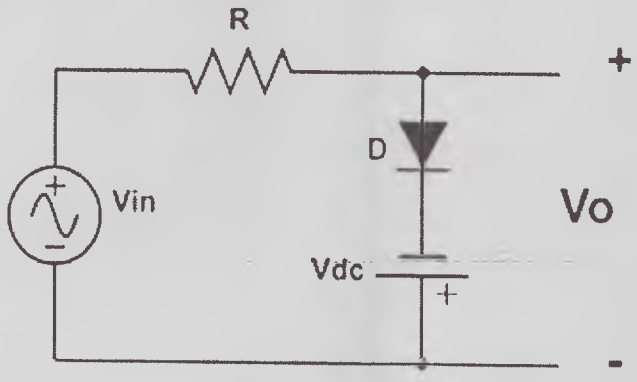
Munshi Nagar, Andheri (West), Mumbai – 400058

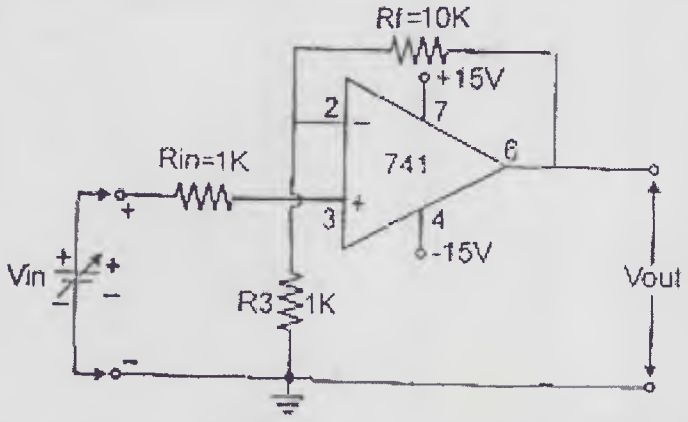
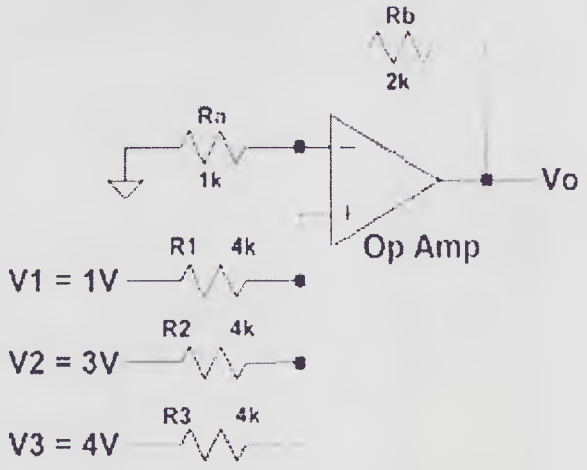
Re Exam Jan 2020

Program: Electrical Engineering
Course code: PC-BTE301
Name of the Course: Electronic Circuits

Duration: 3 Hour
Maximum Marks: 100
Semester: III

Solve any five questions out of seven

Q.		Points	CO	BL	PI
1 A	State whether the following statements are true/false. Justify the same.				
(i)	Open loop opamp is used as amplifier at low frequency.	5	4	5	1.3.1
(ii)	Instrumentation amplifier is used in medical electronics.	5	4	5	1.3.1
B(i)	The input impedance of a MOSFET is of the order of several MΩ	5	2	5	1.3.1
(ii)	R_E in the differential amplifier can be replaced by properly biased BJT	5	3	5	1.3.1
2A	In the circuit arrangement with FET, V_{GG} is 2 V, R_G = 1M Ω, R_D = 2KΩ, V_{DD} = 16 V. I_{DSS} = 10mA, V_P = - 8V. Draw the circuit diagram. Calculate V_{DSQ}. Which type of biasing is used? Explain the same.	10	2	3	2.1.3
B	Draw and explain ac equivalent circuit of JFET. Explain the parameters.	10	2	2	1.3.1
3A (i)	Sketch the output waveform for the following circuit. Input voltage is 5 sin ωt. Vdc = 2.5 V. Assume ideal diode.	05	1	1, 2	1.4.1
					
(ii)	Choose the components (for best design) from the following list to get a circuit which gives a d.c shift of + 5 Volts. Justify the choice of components. Input to be given is 5 sin (2000 π t). Draw the circuit along with the corresponding waveform. Diode, Power supply (0 to 30V). Signal generator. Resistors (1KΩ , 10KΩ, 100KΩ) Capacitors (0.1 μF, 0.01 μF , 0.001 μF)	05	1	5	3.3.1
3B	Determine R_C, R_B for the fixed bias CE BJT circuit such that operating point is V_{CE} = 8 V and I_C = 2 mA . Supply voltage is 15V d.c. Use Si transistor with β = 100. Take base-emitter voltage V_{BE} = 0.6V. Determine stability factor. Draw ac equivalent circuit. Determine Zi, Zo, Av. Given h_{fe} = 100, h_{ie} = 2 kΩ.	10			

4A (i)	Identify the circuit given below. Determine V_o. Explain its working. V_{in} = 0.5 V	5	4	2	2.1.3
					
(ii)	Identify the circuit given below. Determine V_o. Explain its working.	5	4	2	2.1.3
					
4B	The following specifications are given for the dual input, balanced-output differential amplifier : R_C = 3.3 kΩ, R_s = 150 Ω, V_{CC} and V_{EE} are 12V, and -12 V respectively, h_{fe} =100, h_{ie} = 1 kΩ, V_{BE} = 0.7V. R_E = 8.2 kΩ. Draw the circuit diagram. Determine the operating points (I_{CQ} and V_{CEQ}) of the two transistors. Determine A_c, A_d, R_o, R_i, CMRR (dB)	10	3	3	2.1.3
5 A	Draw and explain block diagram of opamp.	10	4	2	2.1.3
B	Explain the following terms w.r.t. opamp IC 741. Specify typical values	10	4	2	1.3.1
	(i) Slew rate (iv) output resistance				
	(ii) UGB (v) CMRR				
	(iii) Input resistance				
6A	Explain the OPAMP as a Schmitt Trigger. Draw corresponding waveforms. What is UTP and LTP?	10	4	2	2.1.3
6B	Explain use of opamp as a differentiator.	10	4	2	2.1.3
7A	Explain dual slope integrating type ADC.	10	4	2	2.1.3
B	Explain R – 2R ladder type digital to analog converter.	10	4	2	2.1.3

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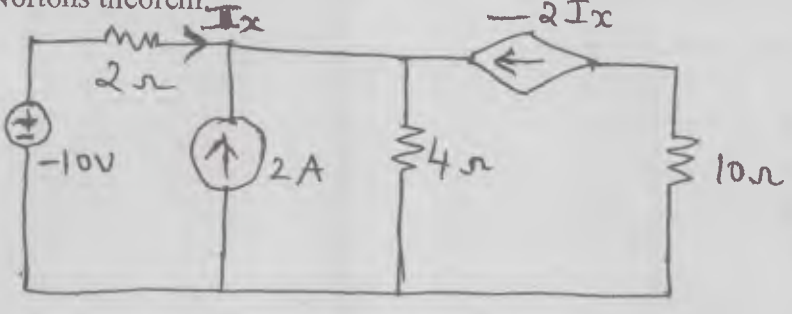
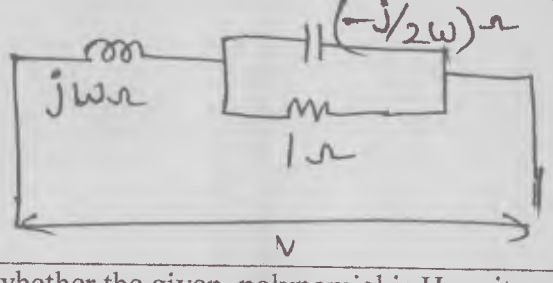
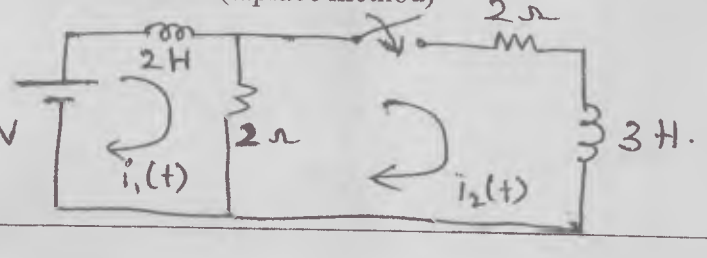
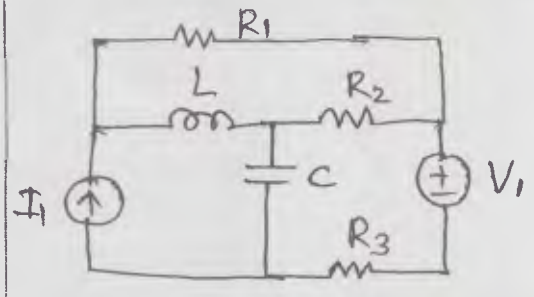
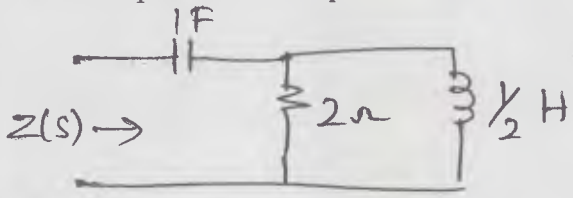
Reexam, Jan 2020

Program: : Electrical Engineering
Course Code : PC-BTE302
Name of the Course: Electrical Networks
Note: Answer any 5 questions…
Assume suitable data if missing

Duration:3 hours
Max points: 100 marks
Semester: III

QN		Marks	CO	BL	PI
1a.	For the circuit through the 2ohm resistor in the network by Nortons theorem 	10	2	3	2.1.3
b.	Find the frequency at which the circuit will be at resonance. 	4	1	3	2.1.3
c	Justify whether the given polynomial is Hurwitz $P(s)=s^4+s^3+2s^2+3s+2$ $P(s)=s^5+s^3+s$	6	4	6	2.4.1
2a.	For the network shown,the switch is closed at t=0,the steady state being reached before t=0.Determine the current through the inductor of 3H.(laplace method) 	8	3	3	1.3.1 2.1.3

b.	For the given network draw oriented graph, write down the f-tie set matrix and f-cutset matrix and incidence matrix. 	8	1	5	2.1.3
c)	Find the poles and zeros of the impedence of the given network and plot them on s plane 	4	2	3	2.1.3
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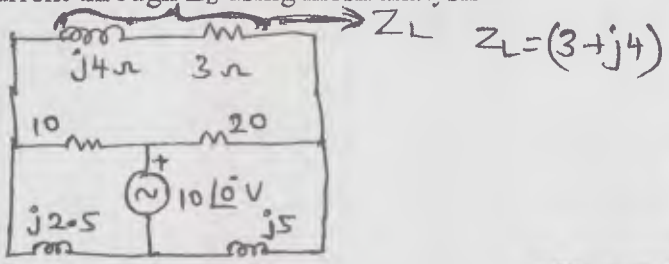
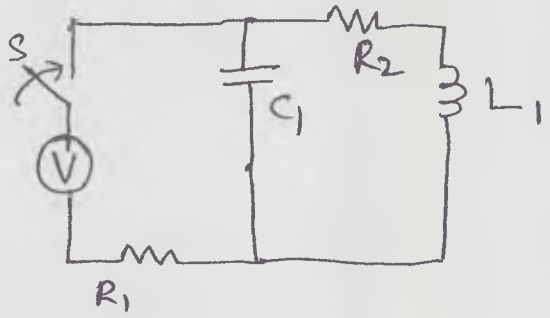
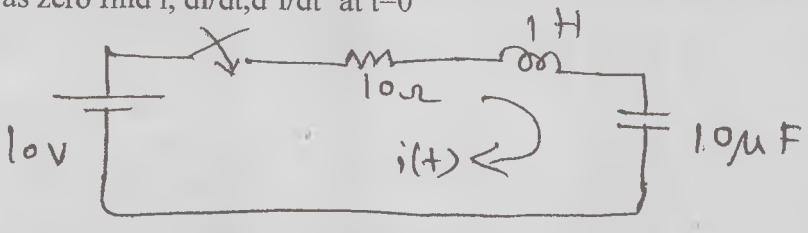
b.	Find the current through Z_L using mesh analysis 	12	1	3	2.1.3
4a	Draw the dual of the given network. 	5	2	5	2.1.3

b	In the network switch is closed Assuming all initial conditions as zero find i, di/dt,d^2i/dt^2 at $t=0^+$ 	10	4	5	2.1.3
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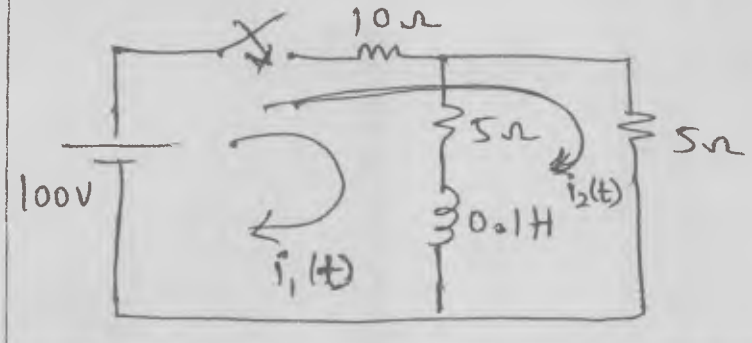
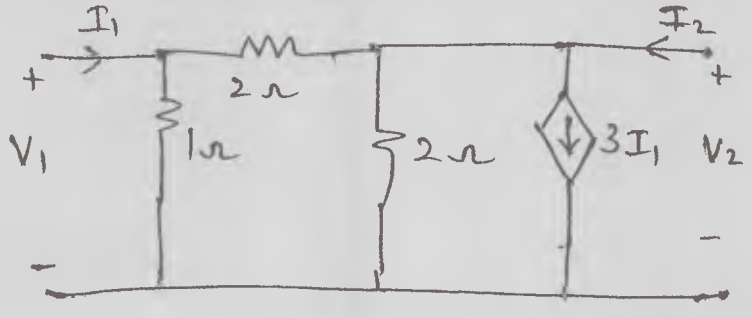
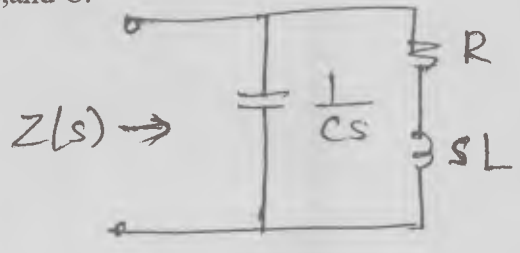
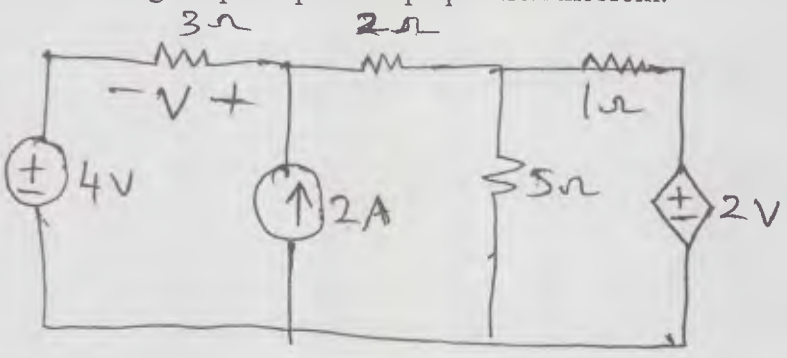
5a	In the network determine currents $i_1(t)$ and $i_2(t)$ when the switch is closed at t=0. 	10	2	3	2.1.3
b	Determine the Y and Z parameters for the given network 	10	4	3	1.3.1
6a	A network is shown in fig.The poles and zeros of the driving point function Z(s) of this network are at the following places. Poles at $-\frac{1}{2} \pm j\frac{\sqrt{3}}{2}$,Zero at -1.If Z(j0)=1,Find the values of R,L,and C. 	10	4	4	1.3.1

b.	Find V_0 using the principle of superposition theorem. 	10	1	3	2.1.3
7a.	Realize the Foster I and II forms of the LC impedance function $Z(s)=\frac{(s^2+1)(s^2+3)}{s(s^2+2)(s^2+4)}$	12	4	5	2.1.3
b	Synthesize the following LC impedance function in Cauer 1 and II form $Z(s)=\frac{10s^4+12s^2+1}{2s^3+2s}$	8	3	3	2.1.3

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

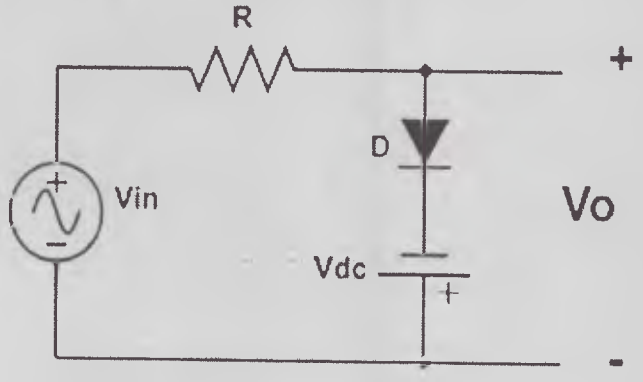
(A Government Aided Autonomous Institute)
Munshi Nagar, Andheri (West), Mumbai – 400058

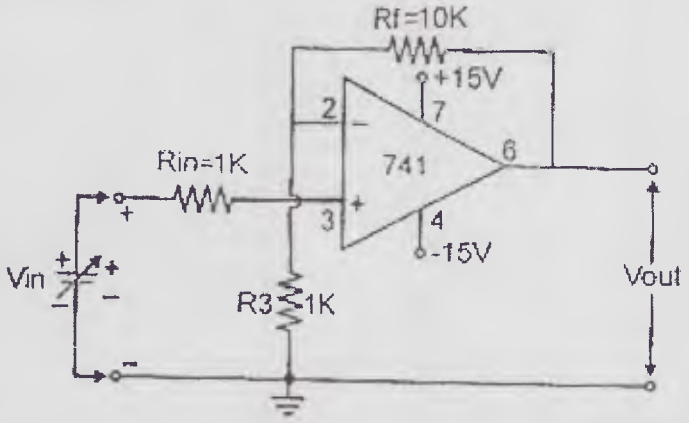
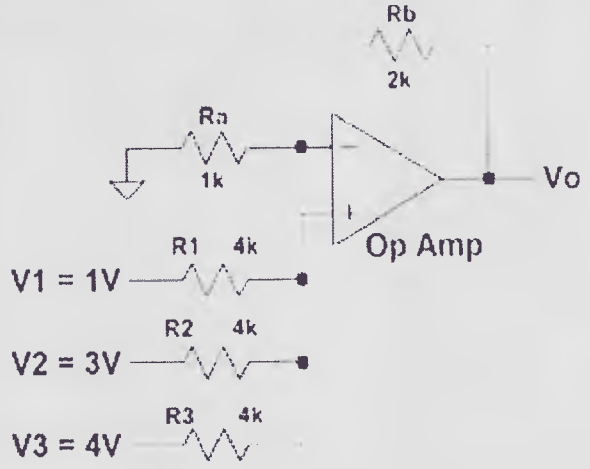
Re Exam Jan 2020

Program: Electrical Engineering
Course code: PC-BTE301
Name of the Course: Electronic Circuits

Duration: 3 Hour
Maximum Marks: 100
Semester: III

Solve any five questions out of seven

Q.		Points	CO	BL	PI
1 A	State whether the following statements are true/false. Justify the same.				
(i)	Open loop opamp is used as amplifier at low frequency.	5	4	5	1.3.1
(ii)	Instrumentation amplifier is used in medical electronics.	5	4	5	1.3.1
B(i)	The input impedance of a MOSFET is of the order of several MΩ	5	2	5	1.3.1
(ii)	R_E in the differential amplifier can be replaced by properly biased BJT	5	3	5	1.3.1
2A	In the circuit arrangement with FET, V_{GG} is 2 V, R_G = 1M Ω, R_D = 2KΩ, V_{DD} = 16 V. I_{DSS} = 10mA, V_P = - 8V. Draw the circuit diagram. Calculate V_{DSQ}. Which type of biasing is used? Explain the same.	10	2	3	2.1.3
B	Draw and explain ac equivalent circuit of JFET. Explain the parameters.	10	2	2	1.3.1
3A (i)	Sketch the output waveform for the following circuit. Input voltage is 5 sin ωt. Vdc = 2.5 V. Assume ideal diode.	05	1	1, 2	1.4.1
					
(ii)	Choose the components (for best design) from the following list to get a circuit which gives a d.c shift of + 5 Volts. Justify the choice of components. Input to be given is 5 sin (2000 π t). Draw the circuit along with the corresponding waveform. Diode, Power supply (0 to 30V). Signal generator. Resistors (1KΩ , 10KΩ, 100KΩ) Capacitors (0.1 μF, 0.01 μF , 0.001 μF)	05	1	5	3.3.1
3B	Determine R_C, R_B for the fixed bias CE BJT circuit such that operating point is V_{CE} = 8 V and I_C = 2 mA . Supply voltage is 15V d.c. Use Si transistor with β = 100. Take base-emitter voltage V_{BE} = 0.6V. Determine stability factor. Draw ac equivalent circuit. Determine Zi, Zo, Av. Given h_{fe} = 100, h_{ie} = 2 kΩ.	10			

4A (i)	Identify the circuit given below. Determine V_o. Explain its working. V_{in} = 0.5 V	5	4	2	2.1.3
					
(ii)	Identify the circuit given below. Determine V_o. Explain its working.	5	4	2	2.1.3
					
4B	The following specifications are given for the dual input, balanced-output differential amplifier : R_C = 3.3 kΩ, R_s = 150 Ω, V_{CC} and V_{EE} are 12V, and -12 V respectively, h_{fe} =100, h_{ie} = 1 kΩ, V_{BE} = 0.7V. R_E = 8.2 kΩ. Draw the circuit diagram. Determine the operating points (I_{CQ} and V_{CEQ}) of the two transistors. Determine A_c, A_d, R_o, R_i, CMRR (dB)	10	3	3	2.1.3
5 A	Draw and explain block diagram of opamp.	10	4	2	2.1.3
B	Explain the following terms w.r.t. opamp IC 741. Specify typical values	10	4	2	1.3.1
	(i) Slew rate (iv) output resistance				
	(ii) UGB (v) CMRR				
	(iii) Input resistance				
6A	Explain the OPAMP as a Schmitt Trigger. Draw corresponding waveforms. What is UTP and LTP?	10	4	2	2.1.3
6B	Explain use of opamp as a differentiator.	10	4	2	2.1.3
7A	Explain dual slope integrating type ADC.	10	4	2	2.1.3
B	Explain R – 2R ladder type digital to analog converter.	10	4	2	2.1.3

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Bharatiya Vidya Bhavan's

Sardar Patel College of Engineering

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

Re Examination

January 2020

Date: 08/01/2020
Duration: 3Hr
Maximum Marks: 100
Semester: III

Program: S.Y. B.Tech.
Course code: BTE206
Name of the Course: Numerical Techniques
Note: Solve any five questions

Q No.		Maximum Marks	Course Outcome No	Module No.
Q1 a)	Evaluate sum $S = \sqrt{3} + \sqrt{5} + \sqrt{7}$ up to four significant digits.	05	04	01
b)	Perform two iterations of bisection method to find root of the equation $f(x) = x^4 - 3x^2 + x - 10 = 0$	05	01,02	02
c)	Differentiate Gauss Elimination and Gauss Jorden methods	05	03	03
d)	Draw the flow diagram of Lagrange's interpolation.	05	03	04
Q2 a)	Evaluate $f(1)$ using second order Taylor series for $f(x) = x^3 - 3x^2 + 5x - 10$	06	01,02	01
b)	Perform four iterations of Newton-Raphson method to obtain root of $f(x) = cos\, x - xe^x = 0$.	07	01,02	02
d)	Find the root of $f(x) = x^3 - 2x - 5 = 0$ by Regula Falsi method. Find the value of x for three iterations.	07	01,02	02
Q3 a)	Solve the following Simultaneous equations using Gauss Elimination method $2x + 2y + z = 1$ $4x + 2y + 2z = 2$ $x + y + z = 3$	06	02,03	03
b)	Explain types of errors with suitable examples. Rounding error, Truncation error, Absolute error, Relative error	06	04	01

c)	From the following table of values x and y obtain $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ at x=2. x: 1, 3, 5, 7 y: 2, 6, 14, 24	08	02,03	05
Q4 a)	Use Simpson's 1/3rd rule to estimate following integration from the limits 0 to 0.8 $f(x) = 0.1 + 0.3x - 100x^2 + 500x^3 - 900x^4$ Evaluate the same using composite trapezoidal method with 8 subintervals	12	01,02	05
c)	Using Gauss Seidel iterative method to solve the following system of simultaneous equations $3x - 0.1y - 0.3z = 7,85,\ 0.1x + 7y - 0.3z = -19.3,\ 0.3x + 0.2y + 10z = 71.4$ perform four iteration	08	01,02	03
Q5 a)	Using Lagranges's interpolation find the form of function $y(x)$ from the following table x: 0, 1, 3, 4 y: -12, 0, 12, 24	10	01,02	04
b)	Employ the following methods for two iterations to find maximum of $f(x) = 4x - 1.8x^2 + 1.2x^3 - 0.3x^4$ (i) Parabolic interpolation with $x_0 = 1.75, x_1 = 2\ and\ 12.5$ Newton's method with $x_0 = 3$	10	02,03	07
Q6 a)	Determine value of y when x=0.1, y(0)=1, h=0.05 and $y' = x^2 + y$ using (i) Euler's method (ii) Modified Euler's method	12	04	06
b)	Draw the flow chart of Fourth order Runge Kutta method and explain the same.	08	03	06
Q7 a)	Use two iterations of parabolic approximation to maximize $A = 4sin\emptyset(1 + cos\emptyset)$ with initial guess 0, $\pi/6$, $\pi/2$.	10	01, 02	07
b)	Consider the following function and locate the minimum by three iterations of Newton's method with $x_0 = -1$. $f(x) = 3 + 6x + 5x^2 + 3x^3 + 4x^4$	10	02,03	07

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Bharatiya Vidya Bhavan's

SARDAR PATEL COLLEGE OF ENGINEERING

(Government Aided Autonomous Institute)

Munshi Nagar, Andheri (W) Mumbai - 400058

End Semester Examinations- January 2020

Program: Electrical Engineering

Course Code: BS-BTE301

Course Name: Applied Mathematics III

Duration: 3 hours

Maximum Points: 100

Semester: III

Instructions:

1. Question No 1 is compulsory.
2. Attempt any four questions out of remaining six.
3. Answers to sub questions should be grouped together.

Q.No.	Questions	Points	CO	BL	PI
1(a)	Prove that $\int_0^{\infty}\left(\frac{\sin 2t+\sin 3t}{te^{t}}\right)dt=\frac{3\pi}{4}$	6	1	ii, iii	1.1 .1
(b)	Find the image of the rectangular region bounded by the lines $x=0,\ x=1,\ y=0,\ y=2$ in the z plane under the transformation $w=z+(2-i)$. Draw the sketch.	6	3	iv, v	[illegible] .1
(c)	Let A be a square matrix of order 3×3 with $\lvert A\rvert=1$. If $\lambda=\frac{-1+i\sqrt{3}}{2}$ is one of the eigen values of A, (i) Find all the eigen values of A (ii) If $A^{100}=pA^2+qA+rI$, find p,q and r	8	4	ii, v	2.4 .1
2(a)	If $L\{erf\sqrt{t}\}=\frac{1}{s\sqrt{s+1}}$, find $L\{te^{-3t}erf(4\sqrt{t})\}$	6	1	[illegible]	[illegible] .1
(b)	If function $f(z)$ is analytic and $\lvert f(z)\rvert$ is constant, prove that $f(z)$ is constant	6	3	ii, iii	1.1 .1
(c)	Find Eigen Values and corresponding Eigen Vectors of the matrix $A=\begin{bmatrix}-2 & -8 & -12\\ 1 & 4 & 4\\ 0 & 0 & 1\end{bmatrix}$	8	4	ii, iii	1.1 .1

3(a)	Reduce the following matrix to normal form and hence find its rank. $A=\begin{bmatrix} 8 & 3 & 6 & 1 \\ -1 & 6 & 4 & 2 \\ 7 & 9 & 10 & 3 \end{bmatrix}$	6	4	i, ii	2.4 .1
(b)	Using method of Laplace Transforms solve following differential equation $(D^2-D-2)y=\sin 2t$ where $y(0)=1,\ y'(0)=2$	6	1	ii, iii	2.4 .1
(c)	Find Fourier Series Expansion of following function in the interval $(0,2\pi)$ $f(x)=\begin{cases} x & 0\le x\le \pi \\ 2\pi-x, & \pi\le x\le 2\pi \end{cases}$	8	2	iv, v	1.1 .1
4(a)	Find the image of the circle $\lvert z-1\rvert=1$ under the transformation $\frac{1}{z}$	6	3	i, ii	1.1 .1
(b)	Find Half Range Fourier sine Series of $f(x)=lx-x^2,\quad 0<x<l$	6	2	iv, v	2.4 .1
(c)	For the following matrix A, find two non-singular matrices P and Q such that PAQ is in the normal form where $A=\begin{bmatrix} 3 & 1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$. Hence find A^{-1}	8	4	ii, iii	2.4 .1

5(a)	Show that the set $S=\{\cos x,\ \cos 2x,\ \cos 3x,\cdots\}$ is Orthogonal over $(0,2\pi)$.	6	2	i, ii	2.4 .1
(b)	If $A=\begin{bmatrix}2 & 3\\ -3 & -4\end{bmatrix}$, using Cayley Hamilton Theorem, find A^{100}	6	4	ii, iii	2.4 .1
(c)	Evaluate (i) $L^{-1}\left\{\frac{2s^2+5s+2}{(s-1)^3}\right\}$ (ii) $L^{-1}\left\{\log\left(1+\frac{4}{s^2}\right)\right\}$	8	1	iv, v	1.1 .1
6(a)	Find an analytic function $f(z)=u(x,y)+iv(x,y)$ if $v=e^{-x}\left[2xy\cos y+\left(y^2-x^2\right)\sin y\right]$	6	3	ii, v	1.1 .1
(b)	Find Eigen values of the matrix $A=\begin{bmatrix}\cos\theta & \sin\theta & 0\\ -\sin\theta & \cos\theta & 0\\ 0 & 0 & 1\end{bmatrix}$	6	4	iv, v	2.4 .1
(c)	Find the bilinear transformation which maps the points 2, i, -2 of $z-$plane onto 1, i, -1 of $w-$plane respectively	8	3	i, ii	1.1 .1
7(a)	Show that the transformation $w=\frac{5-4z}{4z-2}$ transforms the circle $\lvert z\rvert=1$ into a circle in the w-plane.	6	3	i, ii	1.1 .1
(b)	Test the consistency of the following system of equations and solve them if they are consistent $4x-2y+6z=8$ $x+y-3z=-1$ $15x-3y+9z=21$	6	4	ii, iii	2.4 .1
(c)	Evaluate $L^{-1}\left\{\frac{s}{s^4+4}\right\}$	8	1	ii, v	1.1 .1