University of Mumbai

Examinations Summer 2022

Program: BE

Program No : Program: BE

Program No : 1T01224

Name of the Examination : S.E.(Electronics Engineering)(SEM-III)(Choice Base Credit Grading System) (R- 19) (C Scheme)

Subject (Paper Code): 51321 / / Engineering Mathematics-III

Time: 2 hour 30 minutes Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Laplace Transform of $\{e^{2t}(1+sint)\}$ is
Option A:	$\frac{1}{(s+2)}+\frac{1}{(s+2)^2+1}$
Option B:	$\frac{1}{(s-2)}+\frac{s}{(s-2)^2+1}$
Option C:	$\frac{1}{(s-2)}+\frac{1}{(s-2)^2+1}$
Option D:	$\frac{1}{(s-2)}+\frac{1}{(s-2)^2-1}$
2.	If $L[f(t)]=\frac{4s}{s^2-9}$, find $L[f(2t)]$
Option A:	$\frac{s}{s^2-36}$
Option B:	$\frac{4s}{s^2-36}$
Option C:	$\frac{4s}{s^2-9}$
Option D:	$\frac{4s}{s^2-18}$
3.	Inverse Laplace Transform of $\frac{1}{s^4}$ is
Option A:	$\frac{1}{3!}t^4$
Option B:	$\frac{1}{2!}t^4$
Option C:	$\frac{1}{3!}t^3$
Option D:	$\frac{1}{4!}t^4$
4.	Find Fourier coefficient b_n for the function $f(x)=1-x^2$, $-1\le x\le 1$
Option A:	$\frac{2}{3}$
Option B:	$\frac{1}{3}$
Option C:	0
Option D:	$-\frac{2}{3}$

5.	Find Fourier coefficient b_1 in half range sine series for the function $f(x) = sinx,\ 0 < x < \pi$?
Option A:	$\frac{\pi}{2}$
Option B:	0
Option C:	1
Option D:	-1
6.	Evaluate $\int_c z\,dz$ from z = 0 to z = 1+ i along curve y =x
Option A:	2i
Option B:	I
Option C:	-2i
Option D:	-i
7.	Which of the following is related to Cauchy-Riemann equations?
Option A:	$u_x = v_y, u_y = v_x$
Option B:	$u_x = -v_y, u_y = v_x$
Option C:	$u_x = v_y, u_y = -v_x$
Option D:	$u_x = u_y,\ v_y = v_x$
8.	If $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$ find A^4.
Option A:	$5I$
Option B:	$25I$
Option C:	$125I$
Option D:	$625I$
9.	If $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 2 & 0 \\ 3 & 5 & 1 \end{bmatrix}$ Find Eigen Values of $A^2 + I$
Option A:	1,2,1
Option B:	1,4,1
Option C:	2,5,2
Option D:	9,4,1
10.	A vector field which has a vanishing divergence is called as _____
Option A:	Solenoidal field
Option B:	Rotational field
Option C:	Hemispheroidal field
Option D:	Irrotational field

Q2	**Solve any Four out of Six** **5 marks each**
A	Find L$[e^{2t}sin^2t]$
B	Evaluate $\int_0^{1+i}(x^2 - iy)\ dz$ along the path y = x
C	Obtain the Fourier series for $f(x) = x$ in (0,2π).
D	Find $L^{-1}\left[\frac{1}{s(s^2+9)}\right]$

E	Find the eigen values and eigen vector for A = $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$
F	Show that $\bar{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both irrotational and solenoidal

Q3	**Solve any Four out of Six** **5 marks each**
A	Find L$[(1+t)^3]$
B	Find the constants a, b, c, d, e if $f(z) = (ax^3 + bxy^2 + 3x^2 + cy^2 + x) + i(dx^2y - 2y^3 + exy + y)$ is analytic.
C	Find Fourier expansion of f(x) = 2x in (0,3)
D	If$A = \begin{bmatrix} -1 & 4 \\ 2 & 1 \end{bmatrix}$ $3\tan A = A\tan 3$
E	Evaluate$\int_A^B (ydx + xdy)$ along y = x^2 from A (0,0) to B (1,1)
F	Find inverse Laplace of $\log(\frac{s+1}{s+2})$

Q4	**Solve any Four out of Six** **5 marks each**
A	Evaluate $\int_0^\infty e^{-t}\left(\frac{\cos 3t - \cos t}{t}\right) dt$
B	Find the inverse Laplace transform by using convolution theorem $\frac{1}{(s-a)(s-b)}$
C	Obtain the half range Fourier cosine series expansion for f(x) = x(2 − x) in (0,2)
D	Obtain the orthogonal trajectories for the family of curves $e^{-x}\cos y = C$.
E	What is the divergence and curl of the vector field $\vec{f} = 3x^2\hat{\imath} + 5xy^2\hat{\jmath} + xyz^3\hat{k}$ at the point (1, 2, 3).
F	Verify Cayley- Hamilton theorem for A = $\begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & -6 \\ -1 & -2 & 0 \end{bmatrix}$

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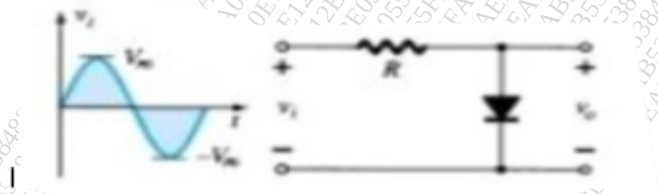
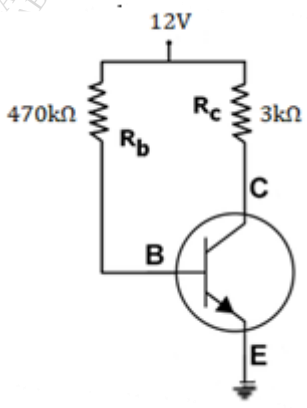
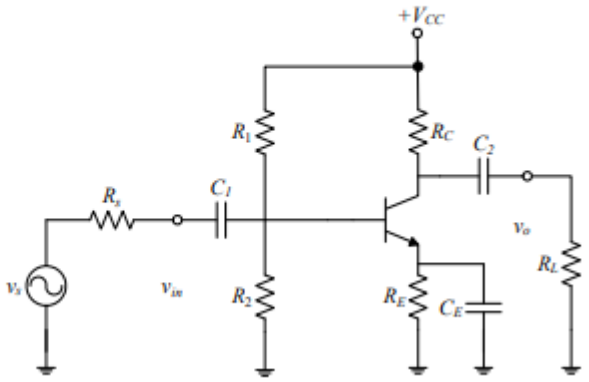
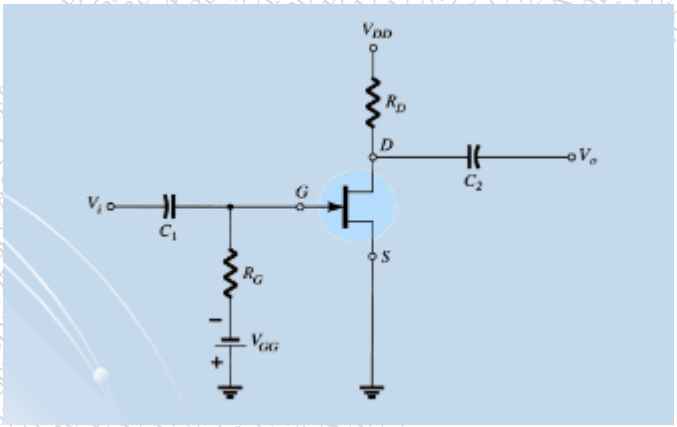
Time: 2hour 30 minutes **Max. Marks: 80**

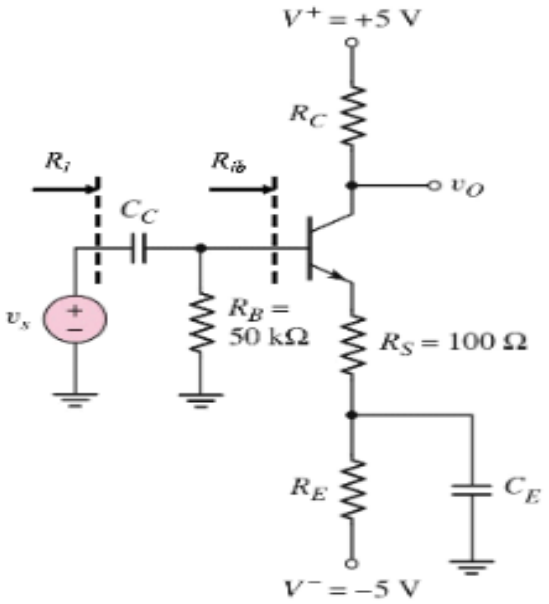
Q1. (20 Marks)	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Name the current produced due to motion of charge carriers from a region of higher concentration to a region of lower concentration?
Option A:	drift current
Option B:	diffusion current
Option C:	electron current
Option D:	hole current
2.	Why is the silicon mostly chosen when compared to germanium?
Option A:	low power consumption
Option B:	high efficiency
Option C:	greater working temperature
Option D:	large I_{CBO}
3.	Assume the diode is ideal. What will be the peak value of the output waveform for the given circuit. 
Option A:	Vm
Option B:	-Vm
Option C:	+(Vm-Vd)
Option D:	-(Vm-Vd)
4.	For following which two transistors Shockley's equation is applied to relate the input and output quantities?
Option A:	BJT and FET
Option B:	BJT and JFET
Option C:	BJT and depletion-type MOSFETs
Option D:	JFETS and depletion-type MOSFETs
5.	Calculate the base resistance R_B for the fixed bias common emitter BJT for dc voltage Vcc = 20V and base current I_B = 25µA. Assume V_{BE} =0.7V
Option A:	50 KΩ
Option B:	700KΩ
Option C:	500 Ω
Option D:	772KΩ
6.	For the common-base characteristics the maximum power curve is defined by the following equation
Option A:	$Pc_{max} = V_{CB}I_C$

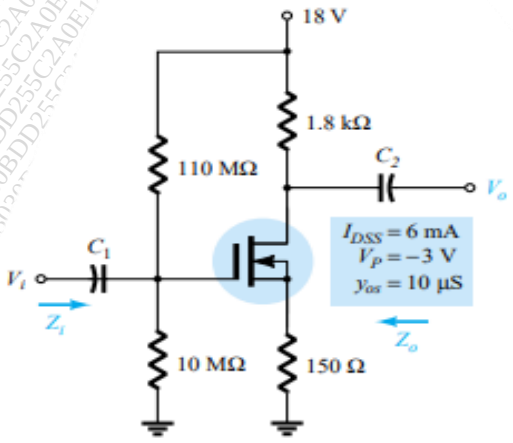
Option B:	$Pc_{max} = V_{CB}/I_C$
Option C:	$Pc_{max} = V_{CB}+I_C$
Option D:	$Pc_{max} = V_{CB}-I_C$
7.	What will be the current flowing through the gate terminal of an FET?
Option A:	IDSS
Option B:	IDSS/2
Option C:	IDSS/4
Option D:	zero
8.	If a MOSFET is to be used as an amplifier then it must work in _____
Option A:	Cut-off region
Option B:	Triode region
Option C:	Saturation region
Option D:	Both cut-off and triode region can be used
9.	If I_{DSS} =10mA, V_P = -8V, calculate I_{DQ} when V_{GS}= -2V for n channel fixed bias JFET
Option A:	10mA
Option B:	1.6mA
Option C:	5.625 mA
Option D:	40mA
10.	There is no direct electrical connection between the -------terminal and the channel of a MOSFET
Option A:	Drain
Option B:	Gate
Option C:	Collector
Option D:	Emitter

Q2 (20 Marks)	
A	**Solve any Two (5 marks each)**
i.	Explain Construction, Operation and Characteristics of Schottky diode.
ii.	Write the diode equation and discuss the effect of temperature on diode current.
iii.	Find IBQ, ICQ and VCEQ for the given bias circuit. Given β=100 
B	**Solve any One** **10 marks each**
i.	Determine Zi, Zo, Av, Ai and calculate the same for the circuit given below.

	Given that $V_{CC} = 15$ V, $\beta = 150$, $V_{BE} = 0.7$ V, $R_E = 1\ \text{k}\Omega$, $R_C = 4.7\ \text{k}\Omega$, $R_1 = 47\ \text{k}\Omega$, $R_2 = 10\ \text{k}\Omega$, $R_L = 47\ \text{k}\Omega$, $R_s = 100\ \Omega$. 
ii.	Determine I_{DQ}, V_{GSQ}, V_{DSQ} and draw the transfer characteristics for the network shown in Figure. Given data is V_{DD}=16V, R_D=2K, R_G=1M, V_{GG}=2V, I_{DSS}=10mA, V_P = -8V 

Q3 **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Only draw the energy band diagrams of the diode in equilibrium condition, forward bias and reverse bias.
ii.	Explain Construction, Operation and Characteristics of E-MOSFET.
iii.	Explain the construction, working and characteristics of Photodiode.
B	**Solve any One** **10 marks each**
i.	Design a single stage CE Amplifier to give a voltage gain Av≥ 125 with stability factor S≤10 and output voltage of, Vo rms=3V. Assume Vcc=18V and VBE=0.7V. Use npn transistor with specifications: hfe (min)=145, hfe(typ)=180, hie=4.5kΩ, and frequency FL≤ 50 Hz. ,
ii.	For the circuit shown in figure, the transistor parameters are β = 100 and VA = ∞. Determine Rc, R_E, r_π, r_o and g_m such that ICQ = 0.25 mA and VCEQ = 3V.



Q4 **(20 Marks)**	
A	**Solve any Two** **5 marks each**
i.	Draw Half wave rectifier circuit and explain working with waveforms.
ii.	Write short note on Zener as Voltage Regulator.
iii.	Draw and Explain biasing methods for D-MOSFET.
B	**Solve any One** **10 marks each**
i.	Explain Full Wave Bridge rectifier with a neat, labeled circuit diagram & input-Output Waveforms. Also determine the expressions for the following a. I_{DC}, I_{rms}, V_{DC}, b. Output Power (P_{DC}) c. Input Power (P_{AC}) d. Rectifier Efficiency e. Ripple Factor f. Peak Inverse Voltage (PIV) g. Transformer Utilization Factor (TUF) h. % Voltage Regulation
ii.	Determine Zi, Zo and voltage gain for the given circuit., if VGSQ=0.35 V & IDQ=7.6 mA. 

University of Mumbai

Examinations Summer 2022

Program: **Electronics Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: ELC303 and Course Name: Digital Logic Circuits

Time: 2 hour 30 minutes Max. Marks: 80

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Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Convert hexadecimal number ABC into decimal
Option A:	2847
Option B:	2748
Option C:	2478
Option D:	2874
2.	The minimum number of 2-input NAND gates are required to realize a half adder is
Option A:	8
Option B:	5
Option C:	6
Option D:	4
3.	How many IC 74151 required to implement four variable boolean function?
Option A:	4
Option B:	3
Option C:	2
Option D:	1
4.	Which of the following expressions is in the sum-of-products (SOP) form?
Option A:	$(A + B)(C + D)$
Option B:	$(A)B(CD)$
Option C:	$AB(CD)$
Option D:	AB +CD
5.	The characteristics equation for T flip flop is_____
Option A:	Qn* = T Qn’ + T' Qn
Option B:	Qn* = T 'Qn' + T Qn
Option C:	Qn* = T Qn' + Qn
Option D:	Qn* = T + T' Qn
6.	An *n*-bit Johnson counter cycles through __ states
Option A:	n
Option B:	2n
Option C:	2^n
Option D:	n^2
7.	In Overlapping Sequence detector
Option A:	the last bit of one sequence does not become the first bit of next sequence
Option B:	the all bits of one sequence become the first bit of next sequence

Option C:	the last bit of one sequence become the first bit of next sequence
Option D:	the first bit of one sequence become the first bit of next sequence
8.	A Mealy machine is a FSM whose
Option A:	output depends on present state
Option B:	output depends on present input as well as present state
Option C:	output depends on present input
Option D:	output depends on only FFs
9.	In a logic family if output logic high is between 3V to 5V and input logic high is 2V to 5V, what is the high level noise margin?
Option A:	0V
Option B:	1V
Option C:	2V
Option D:	3V
10.	For describing circuits like flip flops _____ statement is used
Option A:	entity
Option B:	always
Option C:	component
Option D:	initial

Q.2	**Solve any Four out of Six** **5 marks each** ***Please delete the instruction shown in front of every sub question***
A	Generate 7-bit even parity Hamming code for data 1010
B	Design and implement a Full adder using Half adder.
C	How to overcome race-around condition of JK-FF? Explain in detail.
D	Write a Verilog code for EX-OR gate using Gate-level modelling.
E	Write short notes on Interfacing between CMOS and TTL.
F	Design MOD-10 counter using IC7490

Q.3	**Solve any Two Questions out of Three** **10 marks each**
A	Design Mealy machine to detect overlap sequence 1001
B	Construct 2 input TTL NAND logic gate and explain.
C	Write a Verilog code for Full Adder using CASE statement

Q.4	**Solve**
A	**Solve any Two** **5 marks each**
i.	Convert JK flip flop to T flip flop
ii.	Design a circuit using 2:1 MUX to implement 2-input NAND Gate
iii.	Convert given decimal numbers in Gray code form: 1. $(42)_{10}$ 2. $(17)_{10}$
B	**Solve any One** **10 marks each**
i.	Reduce give logical function using K-map and implement using NAND gates only: $F(A,B,C,D) = \sum m(5,11,13,14,15) + d(4,6,7)$
ii.	Draw a circuit diagram of 4-bit Twisted Ring Counter and also give its output waveforms.

University of Mumbai

Examinations Summer 2022

Program: **Electronics Engineering**

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: ELC304 and Course Name: Electrical Network Analysis & Synthesis

Time: 2 hour 30 minutes Max. Marks: 80

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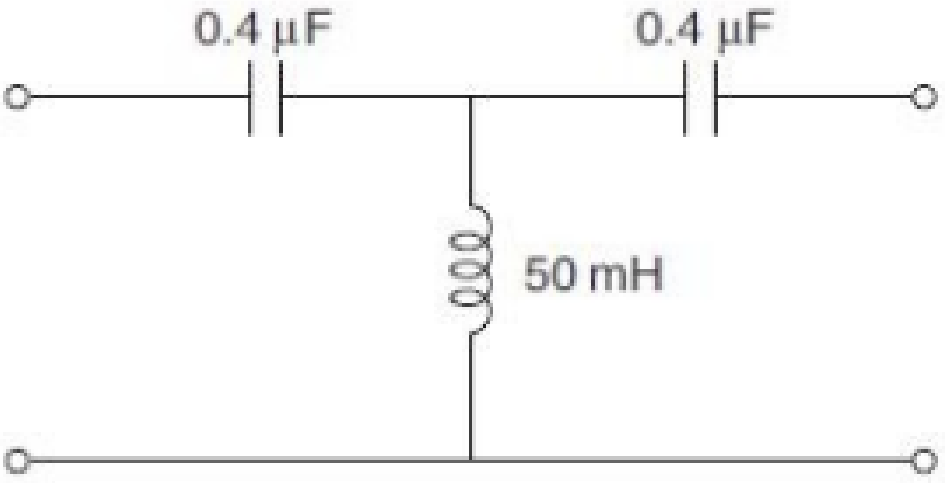
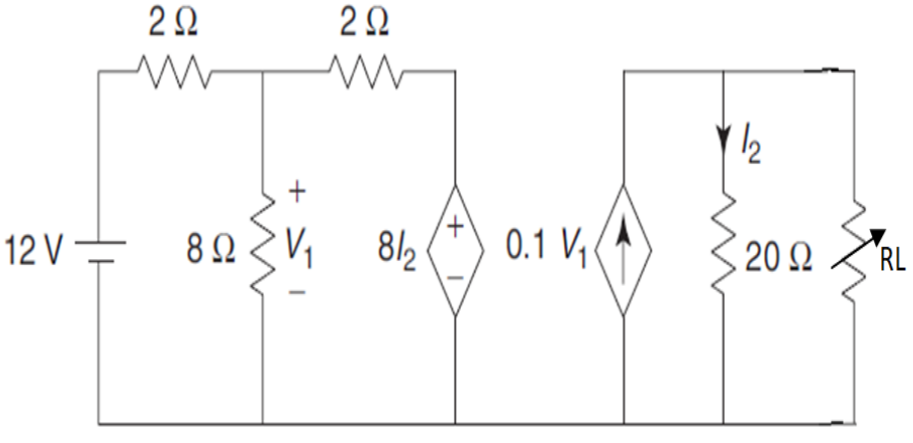
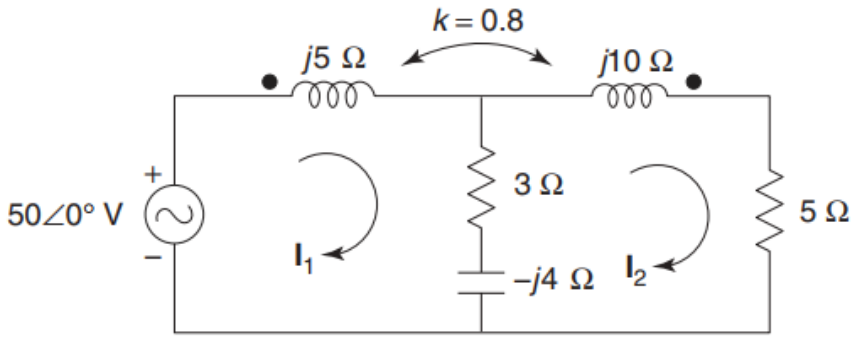
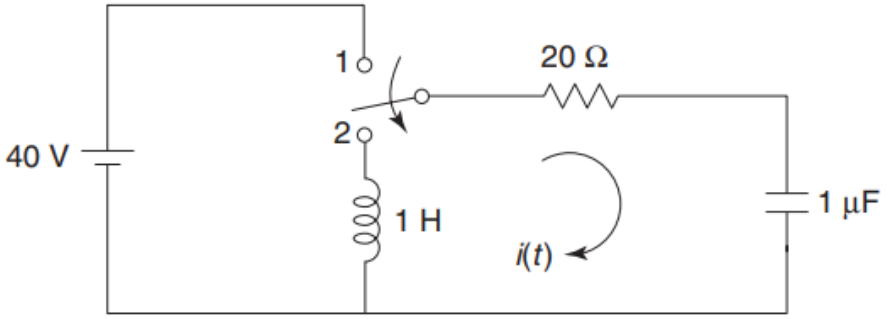
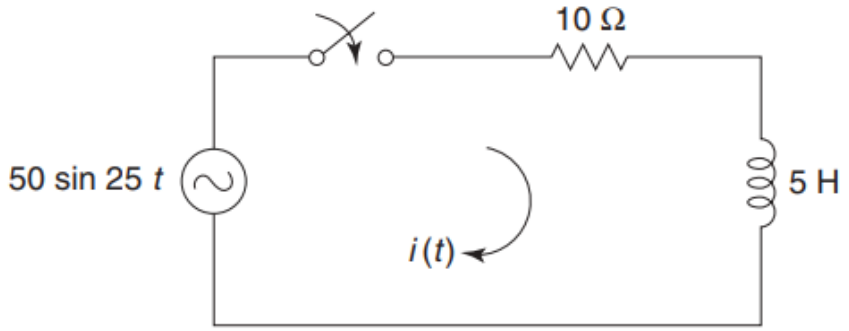
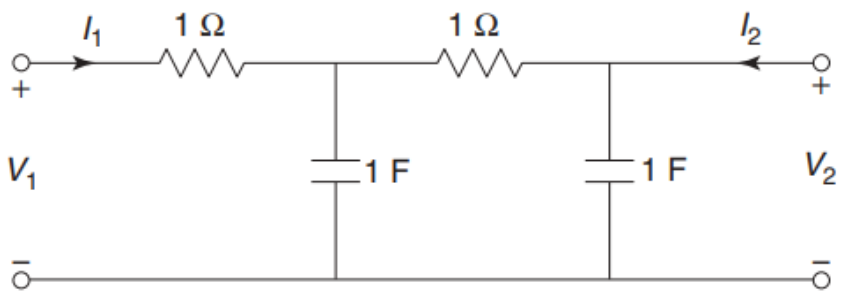
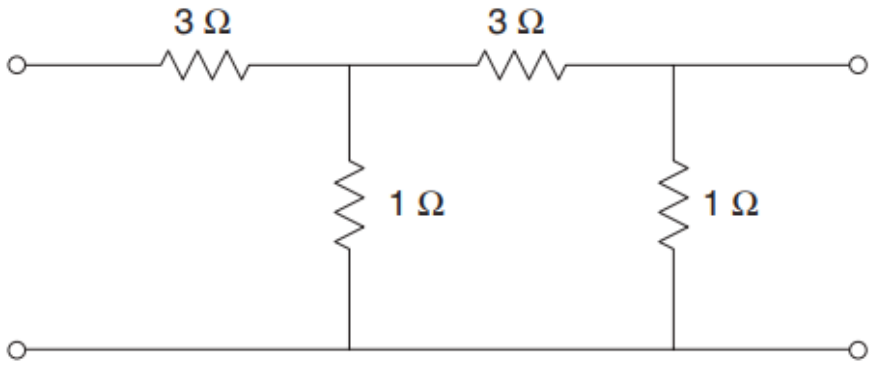
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Which type of function is it in the equation given below $Z(S) = 4(S^2+1)(S^2+9) / S(S^2+4)$
Option A:	RC Function
Option B:	RL Function
Option C:	LC Function
Option D:	RLC Function
2.	Which is the condition of symmetry for ABCD parameters
Option A:	AD-BC = 1
Option B:	B = C
Option C:	AB – CD = 1
Option D:	A = D
3.	 The Cut-off frequency of given circuit is
Option A:	3.183 kHz
Option B:	795.77 Hz
Option C:	1.591 kHz
Option D:	253.3 Hz
4.	Kirchhoff's current law states that
Option A:	Net current flow at the junction is positive
Option B:	Algebraic sum of the currents meeting at the junction is zero
Option C:	No current can leave the junction without some current entering it
Option D:	Current can leave the junction without some current entering it

5.	In time domain analysis, the initial condition from t = -∞ to t = 0^- denotes
Option A:	Just after switching condition
Option B:	Steady State Condition
Option C:	After switching condition
Option D:	Just before switching condition
6.	The s-domain equivalent of voltage source 'V' is written as
Option A:	V/s
Option B:	V
Option C:	s/V
Option D:	Vs
7.	For magnetically coupled circuits, M = K*√ (L1*L2), where K represents
Option A:	Inductance
Option B:	Coefficient of coupling
Option C:	Reluctance
Option D:	Constant
8.	A step function voltage is applied to an RLC series circuit having R=2Ω , L=1H and C=1 F. The Transient response would be
Option A:	Over damped
Option B:	Under damped
Option C:	Damped
Option D:	Critically damped
9.	Which is the condition of symmetry for h parameters
Option A:	h12 = -h21
Option B:	h11h22-h12h21 = 1
Option C:	h11h21-h12h22 = 1
Option D:	h11 = 22
10.	Thevenin resistance is found by
Option A:	Shorting all voltage sources
Option B:	Opening all current sources
Option C:	Shorting all voltage sources and opening all current sources
Option D:	Opening all voltage sources and shorting all current sources

Q2	**Solve any Two Questions out of Three** **10 marks each**
A	For the following circuit find Rth and hence calculate maximum power 

B	Find the voltage across the 5 Ω resistor using mesh analysis 
C	In the network shown in figure the switch is changed from position 1 to position 2 at t = 0, steady condition having reached before switching. Find the values at i, di/dt and d^2i/dt^2 at $t = 0^+$ 

Q3	**Solve any Two Questions out of Three** **10 marks each**
A	Determine the current i(t) in the network when the switch is closed at t= 0 
B	Determine short circuit admittance parameters for the network shown in figure 

C	Two identical sections of the network shown in figure are connected in series parallel. Determine the h parameters of the overall network. 

Q4	Solve any Two Questions out of Three 10 marks each
A	Test whether F(S) = $\frac{2S^3+2S^2+3S+2}{S^2+1}$ is positive real function
B	Realize the Cauer I and Cauer II Forms F(S) = $\frac{(S+1)(S+4)}{S(S+3)}$
C	A π section filter network consists of a series arm inductor of 20 mH and two shunt arm capacitors of 0.16 µF each. Calculate the cut-off frequency and attenuation and phase shift at 15 KHz. What is the value of the nominal impedance in the pass band.