K.T. Exam.

SMT. INDIRA GANDHI COLLEGE OF ENGINEERING

An Autonomous Institute with NAAC 'A' Grade
Approved by AICTE, Affiliated to the University of Mumbai.

END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2432113

Date: 20/12/25

Subject Name: Engineering Mathematics for Electrical Circuits

Subject Code: 2223111 Branch: Electrical

Duration: 2.30 hours

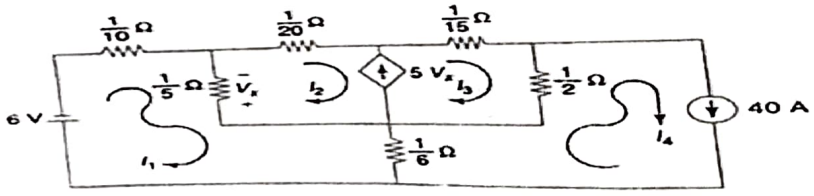
Sem: III

Max Marks: 60

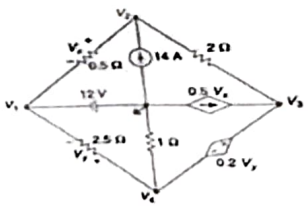
Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	Answer the following (any two)		10
a.	Find Laplace transform of $sinh3t\sin3t\sin5t$.	CO1	05
b.	Prove that $\int_0^\infty \frac{e^{-\sqrt{2}t} sintsinht}{t}\, dt = \frac{\pi}{8}$.	CO1	05
c.	Find inverse Laplace transform $\frac{2s^2-1}{(s^2+1)(s^2+4)}$.	CO1	05
Q.2	Answer the following (any two)		10
a.	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.	CO2	05
b.	Find analytic function whose real part is $u = e^x cosy$.	CO2	05
c.	Show that $f(z) = ze^z$ is analytic and find its derivative.	CO2	05
Q.3	Answer the following (any two)		10
a.	Find the current I_1, I_2, I_3, I_4 for the network	CO3	05



b.	Find the node voltages in the network.	CO3	05



c.	Find the Norton's equivalent network across A-B in the network	CO3	05

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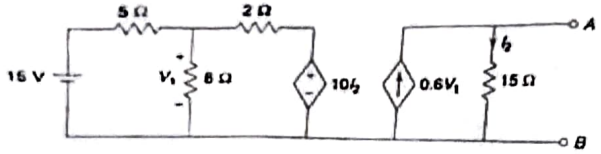
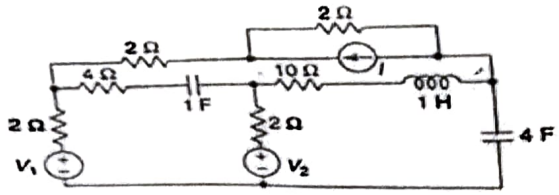
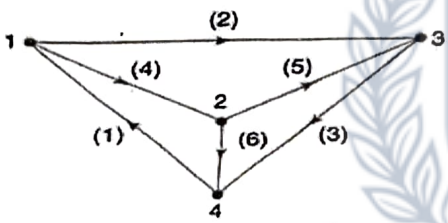


Q.4 Answer the following (any two) 10

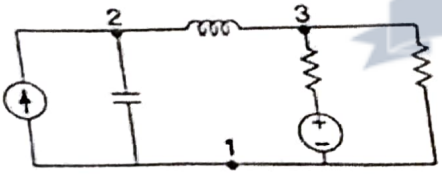
a. Draw the oriented graph and write the [a] incidence matrix [b] tieset matrix and [c] f-cutset matrix for the circuit. CO4 05



b. Write the [a] incidence matrix [b] tieset matrix and [c] f-cutset matrix for the graph of a network is given bellow CO4 05

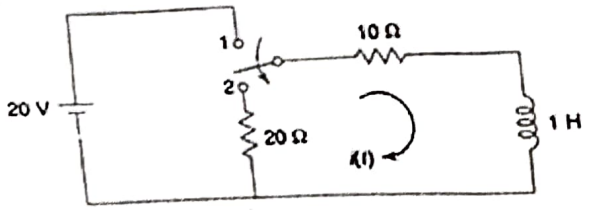


c. How many trees are possible for the graph of the network CO4 05

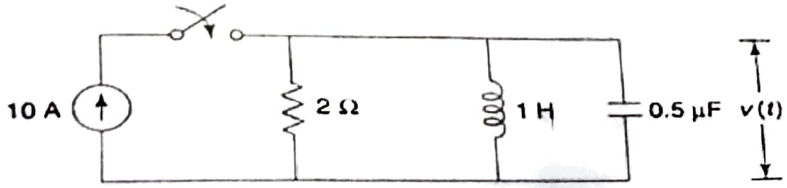


Q.5 Answer the following (any two) 10

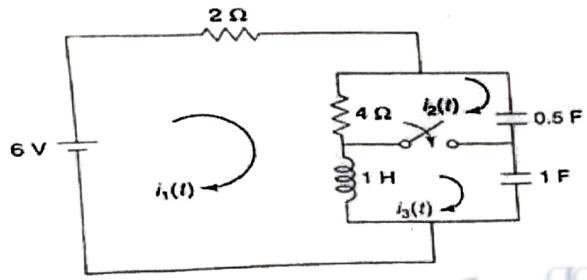
a. Find the value for I, $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$ for the given network of the switch is changed from position 1 to position 2 at t = 0 , steady condition having reached before switching. CO5 05



b. Find the value for v, $\frac{dv}{dt}$ and $\frac{d^2v}{dt^2}$ at $t = 0^+$ for the given network of the switch is closed at t = 0 CO5 05



c. Find the three loop currents at $t = 0^+$ for the given network as shown in figure a study state is reached with switch open at t=0, the switch is closed. CO5 05



Q.6 Answer the following (any two) 10

a. Define the expression for transient current in series RLC circuit with dc excitation. CO6 05

b. Define some important functions of Laplace transforms CO6 05

c. Define frequency domain representations of R-L-C circuits CO6 05

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END SEMESTER EXAMINATION OCT / NOV (SIGCE NEP 2020)

QP Code: 2432132

Date: 26/12/25

Subject Name: **Electronics Engineering**

Subject Code: 2223113 Branch: **Electrical Engineering**

Sem: III

Duration: 2:30 Hours

Max Marks: 60

Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	Answer the following (**any two**)	CO1	**08**
a.	Determine binary and octal numbers represented by following decimal number a) 255, b) 26.25		(04)
b.	Prove the given Boolean expression $(A+B)(A+C) = A+BC$		(04)
c.	Minimize the logic function $f(A,B,C,D) = \sum m(1,3,5,6,7,8,11,12,15)$ by using K map and realize the circuit using NAND gates.		(04)
Q.2	Answer the following (**any two**)	CO2	**12**
a.	Explain the operation of J-k Flipflop with the truth table.		(06)
b.	Implement the following function using 4:1 Multiplexer $F(A,B,C,D) = \sum m(0,1,2,4,6,9,12,14)$		(06)
c.	Explain the types of ROM in details.		(06)
Q.3	Answer the following (**any two**)	CO3	**08**
a.	Explain the construction and working of Enhancement MOSFET.		(04)
b.	Explain construction and working of N channel JFET.		(04)
c.	Describe the construction and operation of Light emitting diode with suitable diagram.		(04)
Q.4	Answer the following (**any two**)	CO4	**08**
a.	Explain the ideal and real characteristics of 741 operational Amplifier.		(04)
b.	Design and explain OP-AMP as an adjustable voltage regulator.		(04)
c.	Derive an expression for voltage gain of an inverting and non-inverting amplifier using OP AMP.		(04)
Q.5	Answer the following (**any two**)	CO5	**16**
a.	What are the parameters over which microcontrollers are selected?		(08)
b.	What are the differences between microcontroller and Microprocessor.		(08)
c.	Compare the varients of MCS-51 family with their features.		(08)
Q.6	Answer the following (**any two**)	CO6	**08**
a.	Which are the special purpose registers in 8051 microcontroller ? Explain function of each.		(04)
b.	Explain the internal architecture of microcontroller 8051 with the help of suitable diagram.		(04)
c.	Describe the Instruction set of 8051 microcontroller with examples.		(04)

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2432122

Subject Name: Electrical Machines - I (EM-I)		Date: 31/10/2025
Subject Code: 2223112	Branch: Electrical	Sem: III
Duration: 2 hours & 30 Minutes		Max Marks: 60

	Note: 1) Attempt all questions 2) Assume suitable data wherever necessary. 3) Figures to the right indicate full marks	**CO**	**Marks**
Q.1	Answer the following (any two)	1	6X2
a.	Assess the necessity of starter & explain 3-point starter of DC motor.	1	6
b.	Deduce the torque Equation of DC motor.	1	6
c.	Assess the process of commutation for DC machine.	1	6
Q.2	Answer the following (any two)	2	6X2
a.	Analyze Construction & working principle of single-phase transformer.	2	6
b.	Examine No load operation of single-phase transformer.	2	6
c.	Analyze Sumpner's Test of single-phase transformer.	2	6
Q.3	Answer the following (any two)	3	6X2
a.	Analyze Construction & working principle of 3-phase transformer.	3	6
b.	Examine the parallel operation of 3-phase transformer.	3	6
c.	Examine the Connections & phasor group of 3-phase transformer.	3	6
Q.4	Answer the following (any two)	4	6X2
a.	Interpret the equivalent circuit of of 3-phase induction motor.	4	6
b.	Assess various losses that occurs in 3-phase induction motor.	4	6
c.	Justify, if three phase winding is fed from three phase supply it produces rotating magnetic field (RMF).	4	6
Q.5	Answer the following (any One)	5	6X1
a.	Apply voltage control & pole changing methods to control speed of 3-phase induction motor.	5	6
b.	Construct Rotor resistance starter of 3-phase induction motor.	5	6
Q.6	Answer the following (any One)	6	6X1
a.	Inspect the Equivalent circuit of single-phase induction motor.	6	6
b.	Examine construction & working principle of capacitor start and run single-phase induction mc	6	6

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END SEMESTER EXAMINATION (SIGCE NEP 2020)

QP Code: 2432151

Subject Name: FINANCIAL MANAGEMENT
Date: 10/11/25
Subject Code: 243215 Branch: ELECTRICAL
Sem: III
Duration: 2.30 Hrs
Max Marks: 60

Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	Answer the following		10
a.	Explain objectives of financial management?	1	05
b.	What are the principles financial management?	1	05
Q.2	Answer the following		10
a.	Describe the classification of cost of capital?	2	05
b.	What are the techniques implicit costs in practice?	2	05
Q.3	Answer the following		20
a.	Discuss the aspects of historical cost and future cost and write the pros and cons?	3	10
	OR		
b.	Discuss the features of specific cost and composite cost (combined)?	3	10
Q.4	Answer the following		10
a.	Explain the key task areas and key responsibilities of a modern financial manager?	1	05
b.	Discuss the summary of key trends with primary impact?	1	05
Q.5	Answer the following		10
a.	What are the key differences of average cost (WACC) and marginal cost (MCC)?	2	05
b.	Determine the graphical Illustration and the practical implications?	2	05
Q.6	Answer the following		20
a.	How tax rate variations influence cost and practical considerations?	3	10
	OR		
b.	Define book -value weights and write advantages and disadvantages?	3	10

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2432141

END SEMESTER EXAMINATION (SIGCE NEP 2020)

Date: 07/11/25

Subject Name: Measurements and Measuring Instruments

Subject Code: 2223114 Branch: Electrical

Sem: III

Duration: 2.5 hours

Max Marks: 60

Note:

1) Attempt all questions
2) Assume suitable data wherever necessary.
3) Figures to the right indicate full marks

		CO	Marks
Q.1	Answer the following (any two)		10
a.	What do you mean by measurement	1	05
b.	Compare deflection type and null type instruments	1	05
c.	Explain instrumental errors	1	05
Q.2	Answer the following (any two)		10
a.	What are the different forces (torques) required for the operation of measuring instruments	2	05
b.	Derive the expression for steady state deflection of PMMC type instruments (d' Arsonval move	2	05
c.	What are the advantages of instrument transformer for range extension	2	05
Q.3	Answer the following (any two)		10
a.	Explain how the effect of lead resistance is eliminated using Kelvin's double bridge	3	05
b.	Explain how the capacitance (Dissipation factor) is measured with the help of Schering bridge.	3	05
c.	Explain calibration of wattmeter using potentiometer.	3	05
Q.4	Answer the following (any two)		10
a.	Explain construction and working of LVDT	4	05
b.	Explain different compensating circuits for thermocouple	4	05
c.	Explain how the pressure is measured using unbonded metal strain gauges	4	05
Q.5	Answer the following (any two)		10
a.	Explain dual slope integrating type Voltmeter	5	05
b.	Explain Resolution and Sensitivity of digital metres.	5	05
c.	Explain current Sensor ACS 712.	5	05
Q.6	Answer the following (any two)		10
a.	Explain smart senso r with block diagram	6	05
b.	Write a note onQ meter.	6	05
c.	Explain with block diagram Smart Energy Metre.	6	05

QPcode: 10082083

SE Sem III rd Electrical R-19 cscheme

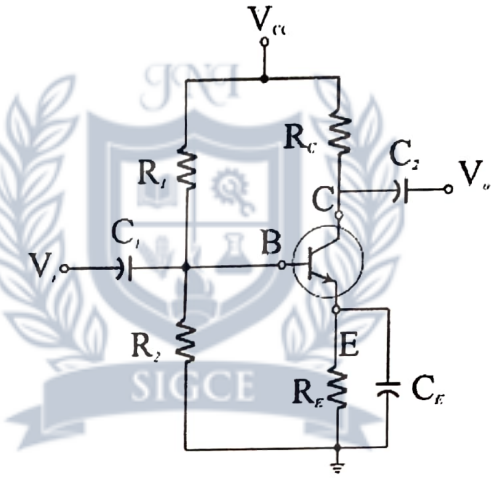
Time: 3 hours **Max. Marks: 80**

Q1) Answer **any four** of the following (entire syllabus)

a. Explain basic construction and operation of diode **(05)**
b. Explain BJT as an amplifier. **(05)**
c. Explain the operation of E-MOSFET. **(05)**
d. Explain the frequency response of an operational amplifier. **(05)**
e. Draw a functional block diagram of IC 555 **(05)**
f. Explain the operation of LED. **(05)**

Q2)

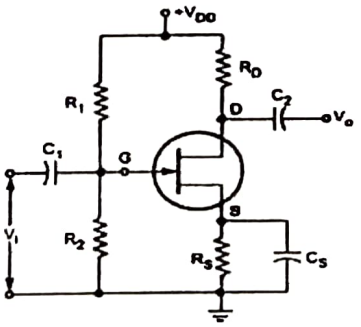
a. Analyse full-wave bridge wave rectifier along with 'LC' filter. Analyse the impact of 'LC'filer over the ripple factor. **(10)**
b. Calculate the Q point in the following circuit of BJT CE voltage divider bias.Given Data: V_{CC}=18 V, R_1= 50KΩ, R_2=10KΩ, R_C=3.3KΩ, R_E=1KΩ, β=100 **(10)**



Q3)

a. Perform small-signal analysis over a BJT CE amplifier with voltage divider bias using the h-model. Derive an expression for current gain, input impedance, voltage gain and output impedance. **(10)**

b. Find I_{DQ}, V_{GSQ}, V_D, and V_{DS} in the given circuit. Given Data:V_{DD}=18 V, R_1= 110MΩ, R_2=10MΩ, R_D=1.82KΩ, R_S=750Ω,I_{DSS}= 6 mA, V_P=$V_{GS(off)}$= -3V **(10)**



Q4)

a. Derive expressions for voltage gain and output impedance of MOSFET CS (Voltage divider bias) amplifier circuit. **(10)**

b. Explain Op-Amp as Schmitt trigger. **(10)**

Q5)

a. Explain Op-Amp as a zero crossing detector. **(10)**

b. Design a voltage regulator using IC LM 317 to produce an output voltage of 10 volts. **(10)**

Q6)

a. Write a short note on a Zener diode and an opto-isolator. **(10)**

b. Explain Op-Amp as a first-order low-pass filter. **(10)**

SE Sem III rd Electrical R-19 CS scheme QP code: 10085660

Duration – 3 Hours **Total Marks - 80**

N.B.: - (1) **Question No.1 is compulsory.**
(2) **Attempt any Three questions out of the remaining five questions.**
(3) Assume suitable data if necessary and justify the same.

Q 1. **Answer any four questions.**

A) Discuss in details skin effect with a neat diagram **05**

B) State the advantages and disadvantages of Solar cell power generation **05**

C) Derive the expression for the insulation resistance of a single core cable. **05**

D) Define string efficiency? Illustrate the any one method of improving string efficiency **05**

E) State the steps to calculate the self GMD of three phase double circuit line. **05**

Q 2 a) A 20km single phase line has two parallel conductors separated by 1.5m.The diameter of each conductor is 0.823cm.If the conductor has resistance of 0.311ohm/km.Find the loop impedance of this at 50 Hz. **10**

Q 2 b) Calculate the inductive reactance of each conductor in a 3 phase, 3 wire line of 80km, when the conductors are arranged in horizontal plane with spacing such that D31=4m, D12=D23=2m.The conductors are transposed and have a diameter of 2.5cm. **10**

Q 3 a) A 3phase ,132 kV,100km, 50Hz, single circuit line has equilateral spacing with 3.5m between conductors. The conductor diameter is 1.2 cm. Calculate **10**
(i) line to neutral capacitance per phase per km
(ii) Charging current per phase
(iii) Charging MVA

Q 3 b) Derive the expression for capacitance of three phase transmission line with unsymmetrical spacing **10**

Q 4 a) Define medium transmission line nominal pi model.Draw the equivalent circuit representation. Derive the expression for regulation and efficiency of medium transmission line Nominalpi method. State the expressions for its A, B, C, D constants alsc, analyse its validity for two port network. **10**

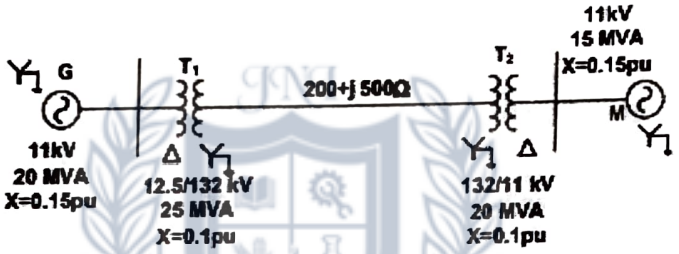
Q 4 b) An overhead 3-phase transmission line delivers 5000kW at 22kV at 0.8pf lagging. The resistance and reactance of each conductor is 4 ohm and 6 ohm respectively. Determine sending end voltage , percentage regulation and transmission efficiency. **10**

Q 5 a) Develop the expression of string efficiency for 2 disc insulators string. **10**

Q 5 b) The three bus-bar conductors in an outdoor substation are supported by units of post type insulators. Each unit consists of a stack of 3 pin type insulators fixed one on the top of the other. The voltage across the lowest insulator is 13.1 kV and that across the next unit is 11 kV. Find the bus-bar voltage of the station. Also calculate the string efficiency **10**

Q 6 a) .Write short note on following (i) step and touch potential (ii) neutral grounding and its method. **10**

Q 6 b) Draw p.u. impedance diagram for the system as shown. Choose base voltage of 11kV and Base MVA as 20 MVA for Generator G. **10**



qp - 0081957

SE | sem III | R-19 c-scheme | electrical

Duration – 3 Hours **Total marks- 80**

Note: - (1) Question No.1 is compulsory.
(2) Attempt any three questions out of the remaining five questions.
(3) Assume suitable data if necessary and justify the same.

Q 1	**Answer the following questions.**	**20M**
	a) What is back emf? Explain the significance of back emf in case of DC Motor	**5M**
	b) Differentiate between active and passive transducers. Give examples of each.	**5M**
	c) Explain i) Magnetic Flux Density ii) Reluctance iii) Magnetic saturation.	**5M**
	d) Which three torques are required for satisfactory operation of analog indicating instrument? State the function of each torque.	**5M**
Q 2 (a)	Explain in brief the principle of electro-mechanical energy conversion and develop a model of electro-mechanical energy conversion device.	**10M**
Q 2 (b)	A 200 V dc series motor runs at 1000 rpm and takes 20A. Combined resistance of armature and field is 0.4 ohm. Calculate the resistance to be inserted in series so as to reduce the speed to 800 rpm, assuming torque to vary as square of the speed and linear magnetization curve.	**10M**
Q 3 (a)	Explain the concept of the energy stored in the magnetic field. Also derive the expression for the energy stored in the magnetic field.	**10M**
Q 3 (b)	Explain the measurement of unknown resistance using Kelvin's double bridge.	**10M**
Q 4 (a)	Describe construction, working principle and theory of dynamometer type wattmeter.	**10M**
Q 4 (b)	Explain with diagram the construction and working principle of LVDT. What are the applications of LVDT?	**10M**
Q 5 (a)	Explain the construction and working principle of digital Tachometer.	**10M**
Q 5 (b)	Explain with phasor diagram how Schering bridge can used to measure unknown capacitor.	**10M**
Q 6 (a)	Explain the Hopkinson's test with neat diagram.	**10M**
Q 6 (b)	Draw and explain working of successive approximation type digital voltmeter	**10M**

SE/sem III/R-19 C-scheme/Electrical Engineering (RT)

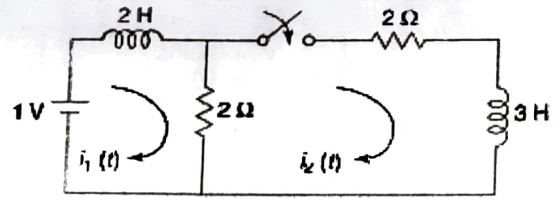
Time: 3 Hrs **Marks: 80**

Note:

- Question No. 1 is compulsory.
- Answer any three from the remaining five questions.
- Assume suitable data if necessary and justify the same.

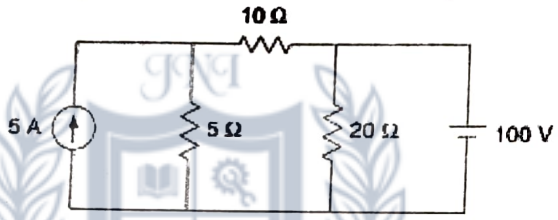
Q1 Each question carries five marks 20M

a In the given network, assuming all initial conditions as zero, find i_1, i_2 at $t=0+$.



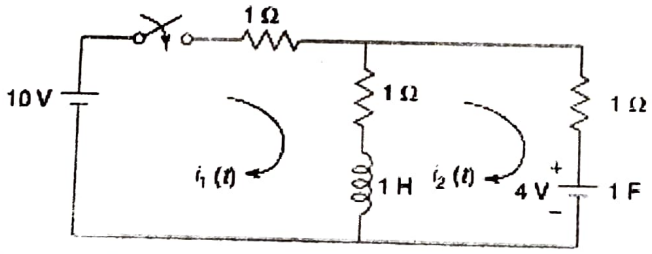
b Derive the condition for reciprocity and symmetry for ABCD-parameters.

c Determine the current through the 20 ohm in the following circuit

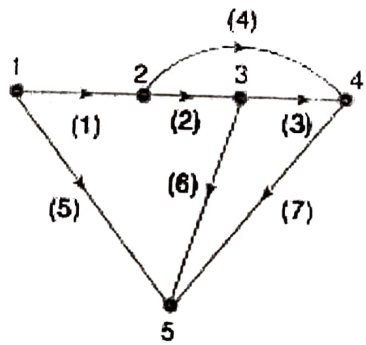


d Obtain the pole-zero plot of the function $F(s)=\frac{s(s+6)}{(s+1)(s+5)}$

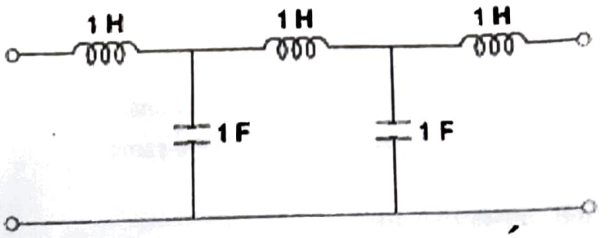
Q2 a For the network shown, the switch is closed at t = 0. Find the currents $i_1(t)$ and $i_2(t)$, when initial current through the inductor is zero and initial voltage on the capacitor is 4V, using Laplace Transform. 10M



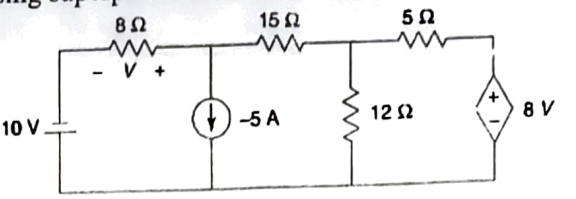
b For the given graph, write the incidence matrix, tieset matrix and f-cutset matrix. 10M



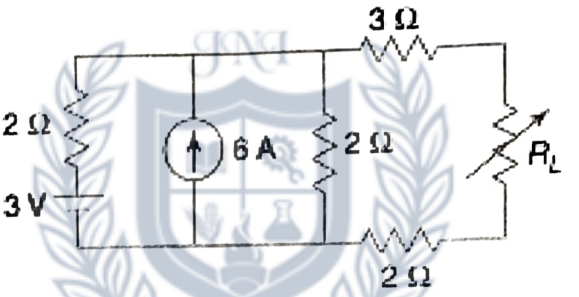
Q3 a Determine the transmission parameters of the network shown using the concept of interconnection of two two-port networks. 10M



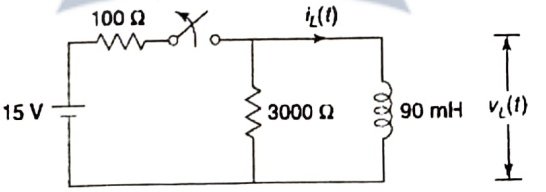
b Find the voltage V using superposition theorem. 10M



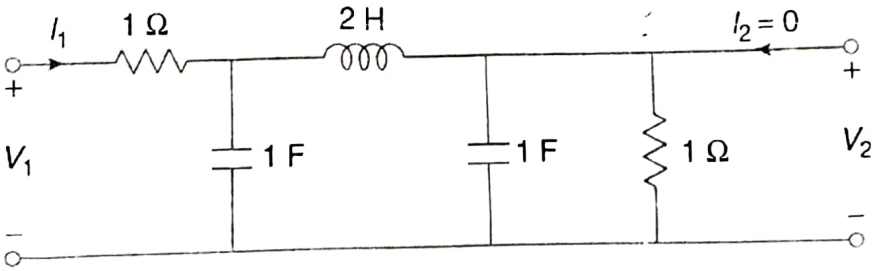
Q4 a Find the value of the resistance R_L for maximum power transfer and calculate the maximum power. 10M



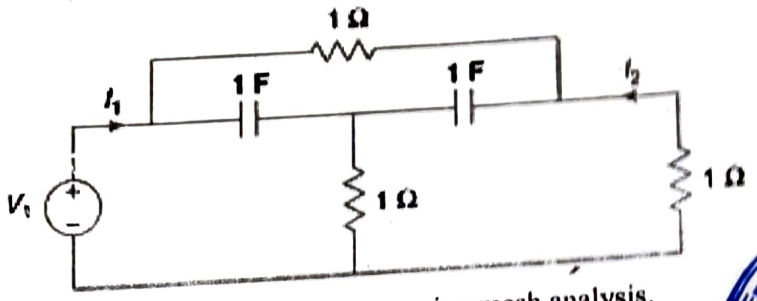
b For the following network, steady state is reached with the switch closed. The switch is opened at t = 0. Obtain expressions for i_L (t) and v_L (t). 10M



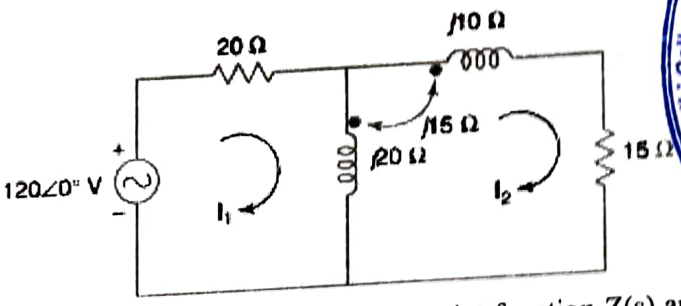
Q5 a For the given ladder network, determine the voltage transfer function V 2 /V 1. 10M



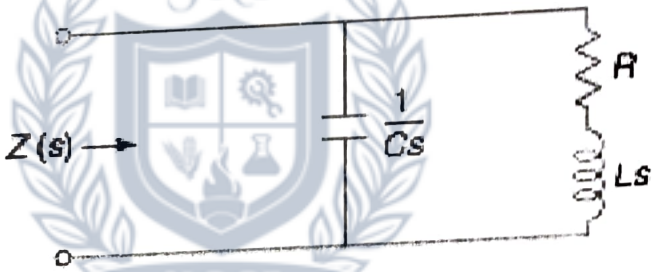
b For the given network, find the driving-point admittance Y_{11} and transfer admittance Y_{12} 10M



Q6 a Determine the voltage across the 15Ω resistor using mesh analysis. 10M



b For the given network, poles and zeros of driving point function Z(s) are, poles: (–1 ± j4); zero: –2. If Z (j0) = 1, find the values of R, L and C. 10M



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QP code: 10086009

SE sem-III Electrical R-19 C scheme

Time: 3 hour **Max. Marks: 80**

Note: 1) Question 1 is compulsory.
2) Attempt any 3 questions from Question 2 to Question 6
3) Figures to the right indicate full marks.

1.(a) Find the Laplace Transform of $f(t) = \int_0^t e^{-3u} sin4u\ du$. **(5)**

(b) If $A = \begin{bmatrix} 2 & 1 & -2 \\ 0 & 1 & 4 \\ 0 & 0 & 3 \end{bmatrix}$, find the eigen values of $A^2 - 2A + I$. **(5)**

(c) Find half-range sine series for $f(x) = \begin{cases} 1, & 0 < x < a/2 \\ -1, & \frac{a}{2} < x < a \end{cases}$. **(5)**

(d) Find the constants a, b, c, d, e if $f(z) = (ax^4 + bx^2y^2 + dx^2 + cy^4 - 2y^2) + i(4x^3y - exy^3 + 4xy)$ is analytic. **(5)**

2.(a) Evaluate $\int_0^\infty \frac{cosat - cosbt}{t} dt$ using Laplace Transform. **(6)**

(b) Show that the function $v = (x^4 - 6x^2y^2 + y^4) + (x^2 - y^2) + 2xy$ is harmonic and find the corresponding analytic function f(z) in terms of z. **(6)**

(c) Find the Fourier Series for $f(x) = \begin{cases} \pi x, & 0 \le x \le 1 \\ \pi(2-x), & 1 \le x \le 2 \end{cases}$, $x \in [0,2]$. **(8)**

3.(a) Find the orthogonal trajectory of the family of curves given by $2x - x^3 + 3xy^2 = a$. **(6)**

(b) Show that $\vec{F} = (y^2 - z^2 + 3yz - 2x)i + (3xz + 2xy)j + (3xy - 2xz + 2z)k$ is both solenoidal and irrotational. **(6)**

(c) Verify Cayley Hamilton theorem for the matrix $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & -1 & 4 \\ 3 & 1 & -1 \end{bmatrix}$ hence find A^{-1}. **(8)**

4.(a) Use Stoke's Theorem to evaluate $\int \vec{F}.\vec{dr}$ where $\vec{F} = (2x - y)i - yz^2j - y^2zk$ and S is the surface of the hemisphere $x^2 + y^2 + z^2 = a^2$, *lying above xy plane.* **(6)**

(b) Find the inverse Laplace Transform of $\frac{s+2}{s^2(s+3)}$. **(6)**

(c) Show that the matrix $A = \begin{bmatrix} 8 & -8 & -2 \\ 4 & -3 & -2 \\ 3 & -4 & 1 \end{bmatrix}$ is diagonalisable. Find the transforming and diagonal matrix. **(8)**

5.(a) Find the Fourier Series for $f(x) = x^2, -\pi \leq x \leq \pi$. (6)

(b) Find $L\{cosht \int_0^t e^u \, coshu \, du\}$ (6)

(c) Find $L^{-1}\{\frac{1}{(s-a)(s+a)^2}\}$ using Convolution Theorem. (8)

6.(a) Evaluate by Green's theorem $\int (x^2 - y)dx + (y^2 + x)dy)$ over the closed curve C of the region bounded by $y = 4$ and $y = x^2$. (6)

(b) Find the inverse Laplace Transform of $log\left(1 + \frac{a^2}{s^2}\right)$. . (6)

(c) Find the eigen values and eigen vectors of $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$ (8)

QP code : 10093157

SE sem III Electrical R-19 C scheme

[Time: 3 Hours] [Total Marks: 80]

Instructions:

1. **Question No: 1 is compulsory.**
2. **Answer any three from the remaining five questions.**

			(5 x 4)
1			
	a)	Explain the working of full wave bridge rectifier circuit with neat waveforms.	
	b)	Interpret the V-I characteristics of MOSFET.	
	c)	Draw and explain the frequency response of BJT amplifiers.	
	d)	Illustrate the working of Schottky diode with its applications.	
2	a)	Illustrate with a neat figure, derive the expression of output voltage of subtractor circuit using op-amp.	**(10)**
	b)	Draw the hybrid equivalent model of voltage divider bias CE amplifier and derive the expression for voltage gain.	**(10)**
3	a)	Illustrate any three biasing circuits employed in MOSFET amplifiers.	**(10)**
	b)	Explain the working of Astable multivibrator using IC555.	**(10)**
4	a)	Illustrate the procedure to find I_{CQ} and V_{CEQ} for an emitter bias BJT Amplifier with an example.	**(10)**
	b)	Illustrate the working MOSFET CS amplifier. Derive the expression of voltage gain.	**(10)**
5	a)	Explain the construction and working of optoisolators.	**(10)**
	b)	Explain the working of op-amp as instrumentation amplifier.	**(10)**
6		Write short notes:	**(20)**
	1)	LED and Zener diodes.	
	2)	Inverting and Non-inverting amplifier using op-amp.	

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Qp code : 10095297

SE sem III Electrical R-19 C scheme

(Time: 3 Hours) [Total Marks: 80]

Note (1) Question No.1 is compulsory
(2) Attempt any three from the remaining
(3) Assume suitable data if necessary

1 Attempt any **four** questions. 20

(a) What is transposition of lines and why it is used?
(b) State factors affecting resistance of the transmission conductor
(c) What is per unit system?
(d) Explain Voltage regulation and Efficiency of transmission line.
(e) Name the conductor is used in transmission line and justify it's selection

2 (a) Derive expression of impedance in per unit for change of base (Zp.u.new). 10

(b) A 3 phase 50 Hz, 150 km long transmission line has the following constants : Inductance /phase /km = 1.2 mH, Resistance/phase/km = 0.15 Ω, Capacitance /phase/km = 0.0096 μf. The line supplies a load of 50 Mw at 0.8p.f. lagging as a line voltage of 132 kV at the receiving end. Using nominal π method, determine Sending end line voltage, Sending end line current, Sending end power factor, % regulation and % efficiency 10

3 (a) Derive the expression for inductance in single phase two wire conductor. 10

(b) Elaborate Ferranti effect in transmission line. 10

4 (a) Draw a schematic diagram of cable which shows all insulating layers used on it. State the use of each layer. 10

(b) Elaborate skin effect and proximity effect in detail. 10

5 (a) Derive the expression for the capacitance of a single phase line. 10

(b) Explain touch and step potential in detail. 10

6 (a) State all methods of neutral earthing and explain them in brief. 10

(b) Derive the A, B, C, D constants for the medium transmission line represented by nominal T-section. 10

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Qpcode : 10095002

SE sem II Electrical R-19 C scheme

Time: 3 Hours **Max. Marks: 80**

N.B. 1. Question no.1 is compulsory.
2. Attempt any three from the rest.
3. Make any suitable assumption wherever required.

Q.1		Answer any four.	
	(a)	Explain both the laws of Farday's magnetic induction and give one application of each.	5M
	(b)	Define following terms i)RMF ii)magnetic saturation and iii)Leakage Flux.	5M
	(c)	Why DC motor needs a starter and how many types of starter do you know for DC Machine?	5M
	(d)	Differentiate between thermocouple and thermistor.	5M
	(e)	Write difference between Resolution & sensitivity of digital meters	5M
Q.2	(a)	Explain the concept of singly excited machines and derive the expression for the electromagnetic torque.	10M
	(b)	What is the armature reaction in DC machine? Explain with neat diagram and methods to overcome armature reaction. Derive expressions for ATd and ATc.	10M
Q.3	(a)	Explain construction & working of PMMC instrument and derive the torque equation.	10M
	(b)	Explain the term Transducer. How will you classify the transducers? Explain Piezo electric transducer.	10M
Q.4	(a)	Explain calibration of ammeter and voltmeter using potentiometer.	10M
	(b)	Write about working of Digital Storage Oscilloscope and Digital Techo Meter.	10M
Q.5	(a)	Explain working principles of digital Voltmeter, Ammeter	10M
	(b)	What are different methods for speed control of DC motor explain Field flux control in detail with diagram and characteristics.	10M
Q.6		Write a short note on any two	
	(a)	Hopkinson's test on DC Machine	10M
	(b)	Energy and co energy stored in magnetic field.	10M
	(c)	Instrument transformers	10M

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QP code : 10086896

SE sem III Electrical R-19 e scheme

Time: 3 Hrs **Marks: 80**

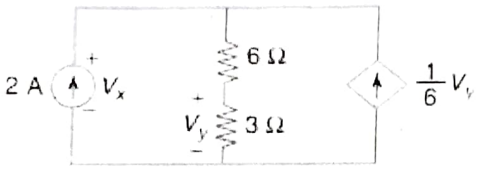
Note:

- Question No. 1 is compulsory.
- Answer any **three** from the remaining five questions.
- Assume suitable data if necessary and justify the same.

Q1 Each question carries five marks 20M

a The voltage V(s) of a network is given by $V(s)=\frac{(s+8)(s+10)}{(s+4)(s^2+2s+2)}$ Plot its pole-zero diagram

b Find the voltage 'V_x' in the following circuit



c The Z-parameters of a two-port network are: Z_{11} = 12 Ω, Z_{12} = Z_{21} = 8 Ω, Z_{22} = 20 Ω. Find the equivalent T-network.

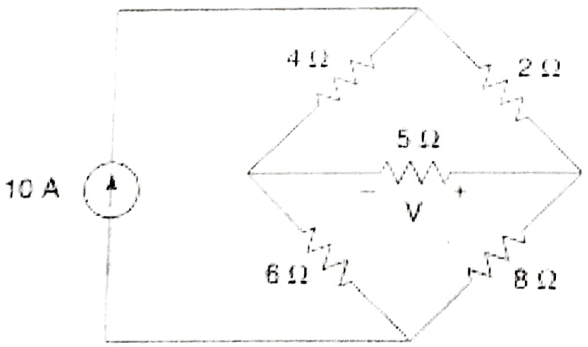
d In the network shown, the switch is closed at t = 0, assuming all initial conditions as zero, determine the current $i_1(0^+)$ and $i_2(0^+)$.

Q2 a The reduced incidence matrix of an oriented graph is 10M

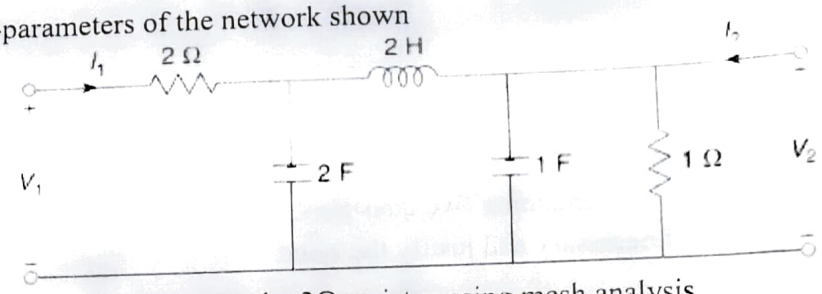
$$A=\begin{bmatrix} 1 & -1 & 1 & 0 & 0 \\ 0 & 0 & -1 & -1 & -1 \\ -1 & 0 & 0 & 1 & 0 \end{bmatrix}$$

(a) Draw the graph. (b) How many trees are possible for this graph? (c) Write the tieset and cutset matrices.

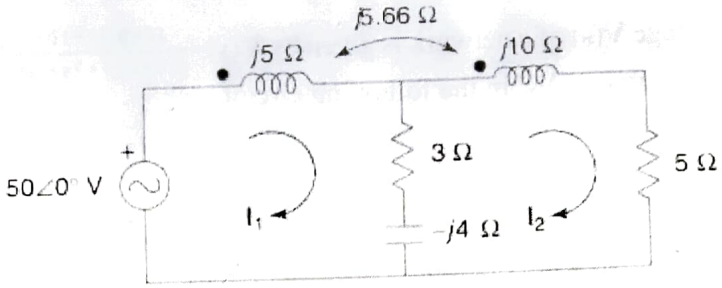
b Find the voltage V and verify reciprocity theorem for the network shown. 10M



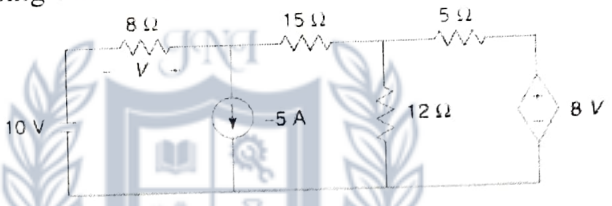
Q3 a Obtain h-parameters of the network shown 10M



b Determine the voltage across the 3Ω resistor using mesh analysis. 10M

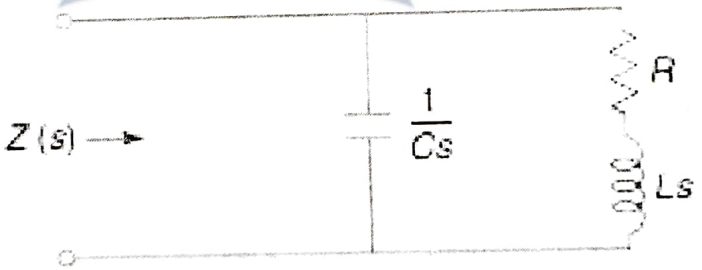


Q4 a Find the voltage V using Thevenin's theorem. 10M

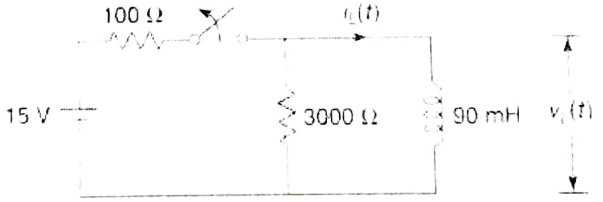


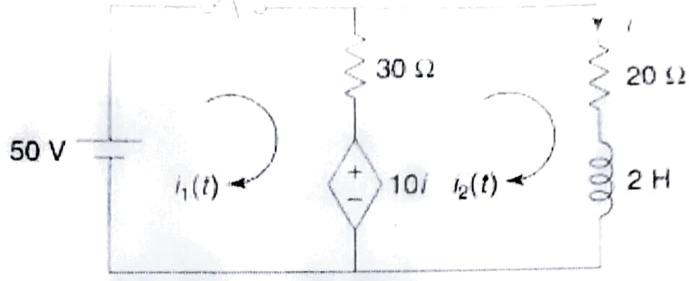
b Derive the condition for reciprocity and symmetry for Y-parameters. 10M

Q5 a For the given network, poles and zeros of driving point function Z(s) are, poles: $(-1 \pm j2)$; zero: -4. If $Z(j0) = 1$, find the values of R, L and C. 10M

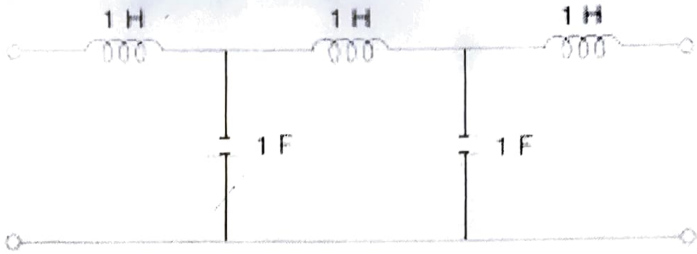


b For the following network, steady state is reached with the switch closed. The switch is opened at t = 0. Obtain expressions for i_L (t) and v_L (t). 10M





b Determine the transmission parameters of the following network. 10M



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SE sem III Electrical R-19 C scheme

QP code: 10093307

Time: 3 hour **Max. Marks: 80**

Note: 1) Question 1 is compulsory.

2) Attempt any 3 questions from Question 2 to Question 6

3) Figures to the right indicate full marks.

Q1 Attempt All questions

A If $A = \begin{bmatrix} -1 & 0 & 0 \\ 2 & -3 & 0 \\ 1 & 4 & -2 \end{bmatrix}$ then find the eigen values of A^2 **5**

B Find Laplace transform of $f(t) = te^t \cos 2t$ **5**

C Find the half range Sine Series for $f(x) = x$, where $x \in (-\pi, \pi)$ **5**

D Determine the constant a, b, c, d if $f(z) = x^2 + 2axy + by^2 + i(cx^2 + 2dxy + y^2)$ is analytic. **5**

Q2

A Using Green's theorem in a plane to evaluate the line integral **6**

$$\oint_C (xy + y^2)dx + x^2 dy$$

Around the boundary of the region defined by $y=x^2$ and $y=x$

B Find the Eigen values and Eigen vectors of the matrix **6**

$$A = \begin{bmatrix} 4 & 2 & -2 \\ -5 & 3 & 2 \\ -2 & 4 & 1 \end{bmatrix}$$

C Show that the function $v = e^x \sin y$ satisfies Laplace's equation, also find analytic function. **8**

Q3

A Prove that $\bar{F} = (x^2 - yz)i + (y^2 - zx)j + (z^2 - xy)k$ is irrotational. **6**

B Find the analytic function whose real part is $x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ **6**

C Verify Cayley-Hamilton theorem for the matrix A and hence find A^{-1} and A^4 where $A = \begin{bmatrix} 2 & -1 & 1 \\ -1 & 2 & -1 \\ 1 & -1 & 2 \end{bmatrix}$ **8**

Q4

A Using Stokes theorem to evaluate $\int_C \bar{F} \cdot d\bar{r}$ 6

Where $\bar{F} = x^2 i + xyj$ where C is the boundary of the rectangle x=0, y=0, x=a, y=b

B 6

Evaluate $\int_0^\infty \frac{e^{-t} sin2t}{t} dt$, using Laplace transforms

C 8

Using Convolution theorem find $L^{-1}\left[\frac{s^2}{(s^2+1)(s^2+4)}\right]$

Q5

A Find $L\{e^{-4t} sin3t\, cos2t\}$ 6

B Prove that the vector field $\bar{F}$ on R^3 defined by 6

$$\bar{F} = (y^2 cosx + z^3)\hat{\imath} + (2ysinx - 4)\hat{\jmath} + (3xz^2 + 2)\hat{k}$$

is conservative and find its scalar potential.

C Find the Fourier Series for $f(x) = \left(\frac{\pi - x}{2}\right)^2$ in $0 \leq x \leq 2\pi$ 8

Q6

A Obtain Fourier series expansion of $f(x) = 4 - x^2$ in (-2, 2) 6

B Prove that the matrix A is diagonalisable, find the transforming matrix and the diagonal matrix. 6

$$A = \begin{bmatrix} -9 & 4 & 4 \\ -8 & 3 & 4 \\ -16 & 8 & 7 \end{bmatrix}$$

C

i) Find $L^{-1}\left\{\log\left(\frac{s^2+1}{s^2+2}\right)\right\}$ 4

ii) Find $L^{-1}\left\{\frac{1}{s^2+2s+10}\right\}$ 4
