

B000311(014)

B.Tech. (Third Semester) Examination

Nov-Dec. 2023

common to all branches

(Civil Engg. Branch)

MATHEMATICS-III

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) is compulsory of each question and attempt any two from (b), (c) and (d) of each questions.

Unit-I

1. (a) Write formula for Laplace transform of a periodic function. 4

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(b) (i) Find out $L(t^2 \sin at)$ 4

(ii) Apply Laplace Transform to Evaluate : 4

$$\int_0^{\infty} te^{-2t} \sin 3t dt$$

(c) (i) Evaluate : 4

$$L^{-1} \left\{ \frac{1}{(s^2+1)(s^2+9)} \right\}$$

(ii) Evaluate : 4

$$L^{-1} \left\{ \frac{s+2}{(s^2+4s+5)^2} \right\}$$

(d) Apply Laplace Transform to find solution

$$ty'' + 2y' + ty = \cos t,$$

given that $y(0) = 1$. 8

Unit-II

2. (a) Form a partial differential equation from the given arbitrary function $f(x^2 + y^2, z - xy) = 0$. 4

(b) Solve the given equation : 8

$$(x^2 - y^2 - z^2)p + 2xyq - 2xz = 0$$

(c) Solve the following equation 8

$$\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial x \partial y} - 6 \frac{\partial^2 z}{\partial y^2} = y \cos x$$

(d) Apply method of separation of variables to solve

$$4 \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u, \text{ given } u(0, y) = 3e^{-y} - e^{-5y}. \quad 8$$

Unit-III

3. (a) The probability density function of a continuous random variable is given by

$$f(x) = \begin{cases} \frac{k}{x^3} & , 5 \leq x \leq 10 \\ 0 & , \text{ otherwise} \end{cases}$$

Find value of k . 4

(b) From a bag containing 3 red and 2 white balls, a man is to draw 2 balls at random without replacement, being promised ₹ 20 for each red ball and ₹ 10 for each white one. Find his expectation. 8

(c) Fit a Poisson distribution to the set of observations :

| | | | | | | |
|--------|---|-----|----|----|---|---|
| x | : | 0 | 1 | 2 | 3 | 4 |
| $f(x)$ | : | 122 | 60 | 15 | 2 | 1 |

Do all the computation for two decimal places. 8

(d) A certain number of articles manufactured in one batch were classified into three categories according to a particular characteristics, being less than 50, between 50 and 60 and greater than 60. If this characteristics is known to be normally distributed, determine the mean and standard deviation for this batch if 60%, 35% and 5% were found in these categories. 8

Unit-IV

4. (a) Find the missing terms in the following data : 4

| | | | | | | |
|--------|---|----|----|----|----|------|
| x | : | 45 | 50 | 55 | 60 | 65 |
| $f(x)$ | : | 3 | - | 2 | - | -2.4 |

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(b) Apply Newton's Backward interpolation formula and obtain the cubic polynomial which takes the following values : 8

| | | | | | |
|--------|---|---|---|---|----|
| x | : | 0 | 1 | 2 | 3 |
| $f(x)$ | : | 1 | 2 | 1 | 10 |

(c) Apply Stirling's and Bessel's central interpolation formula respectively to find $f(29)$ and $f(32)$ from the following data :

| | | | | | | |
|--------|---|---------|---------|--------|---------|---------|
| x | : | 20 | 25 | 30 | 35 | 40 |
| $f(x)$ | : | 11.4699 | 12.7834 | 1.7648 | 14.4982 | 15.0463 |

Do all the calculations for four decimal places. 8

(d) Apply Newton's Divide Difference formula to obtain $f(x)$ as a cubic polynomial which represents the following data : 8

| | | | | | |
|--------|---|---|---|---|---|
| x | : | 1 | 2 | 7 | 8 |
| $f(x)$ | : | 1 | 5 | 5 | 4 |

Unit-V

5. (a) Write Adams-Bashforth predictor - corrector formula, 4

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- (b) Apply Taylor's series and find out series solution up to four non-zero terms for the given equation

$$\frac{dy}{dx} = xy^{\frac{1}{2}} \text{ and } y(1) = 1$$

Do all the calculation for four decimal places and find numerical solution at $y(1.2)$. 8

- (c) Apply Runge Kutta method of fourth order to find out numerical solution of the given differential equation

$$\frac{dy}{dx} + y + xy^2 = 0, \text{ at } y(0.2), \text{ by taking } h = 0.1. \text{ Do}$$

all the calculation for four decimal places. 8

- (d) Apply Milne's predictor corrector method to find numerical solution $y(0.4)$ for the given equation

$$2 \frac{dy}{dx} = (1+x^2)y^2, \text{ where } y(0) = 1, \text{ also given}$$

$y(0.1) = 1.06, y(0.2) = 1.12 \text{ and } y(0.3) = 1.21.$

Do all the calculation for four decimal places. 8

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B. Tech. (Third Semester) Examination,

Nov.-Dec. 2023

(New Scheme)

(Electronics & Telecommunication Engg. Branch)

ELECTRONIC DEVICES

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : All questions are compulsory. Part (a) of each question is compulsory and attempt any two parts from parts (b), (c) and (d). Part (a) is of 2 marks and part (b), (c) and (d) each are of 7 marks.

Unit-I

1. (a) Define mass action law.
- (b) Explain Generation and Recombination of charge carrier.

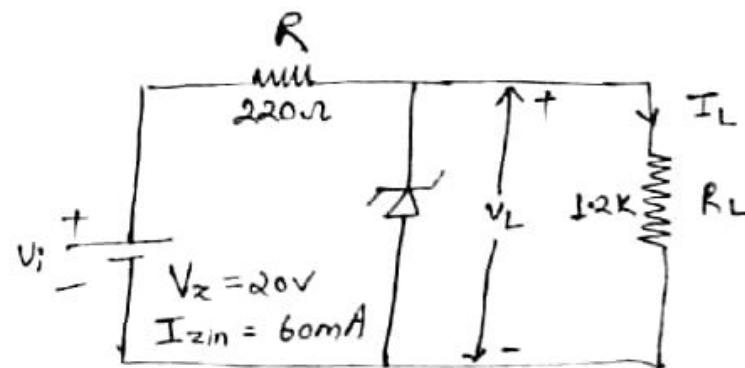
- (c) Derive the expression of drift current density and conductivity.
- (d) A specimen of metal has 7.87×10^{28} free elements per cubic metre. The mobility of electron is $34.8 \text{ cm}^2/\text{V-S}$
- Compute the conductivity of metal
 - If an electric field of 30 V/cm is applied across the specimen, find drift velocity of free electrons and the current density

Unit-II

- Define threshold or cut-in voltage?
 - Draw the circuit diagram of forward biased and reverse biased PN junction diode?
- (c) A full wave PN diode rectifier uses load resistor of 1200Ω . No filter is used. Assume each of two diodes to have idealized characteristics with $R_f = 6\pi$ and $R_r = \infty$. The cut-in voltage may be neglected. Sine wave voltage applied to each diode has amplitude of 30 volts and frequency 50 Hz.

Calculate :

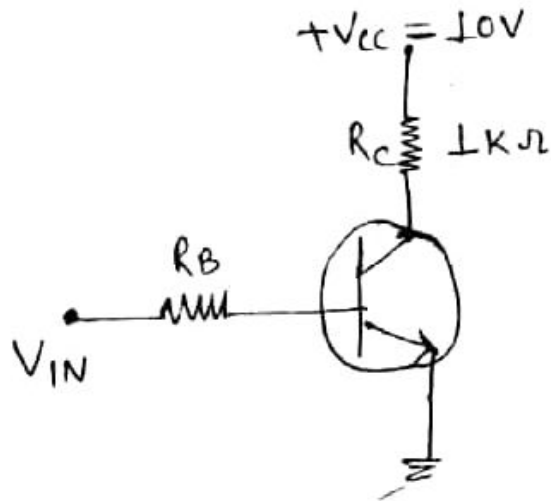
- Peak, DC and RMS load current
 - DC and RMS output voltage
 - DC output power
- (d) Determine the range of values V_i that will maintain the zener diode of below figure in the "ON" state.



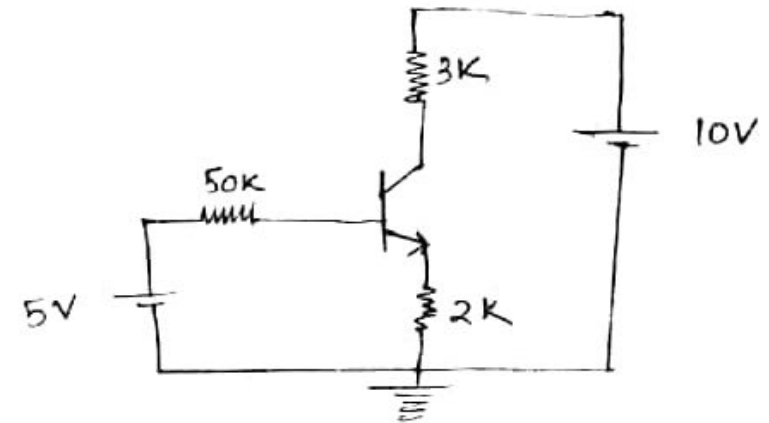
Unit-III

- Explain why transistor is known as current controlled device?
 - Explain base width modulation or early effect with three consequences of it.

- (c) (i) For the transistor circuit shown, what is V_{CE} when $V_{IN} = 0V$?
- (ii) What minimum value of I_B is required to saturate the transistor if β is 200? Neglect $V_{CE}(\text{sat})$
- (iii) Calculate the maximum value R_{IN} of when $V_{IN} = 5V$.

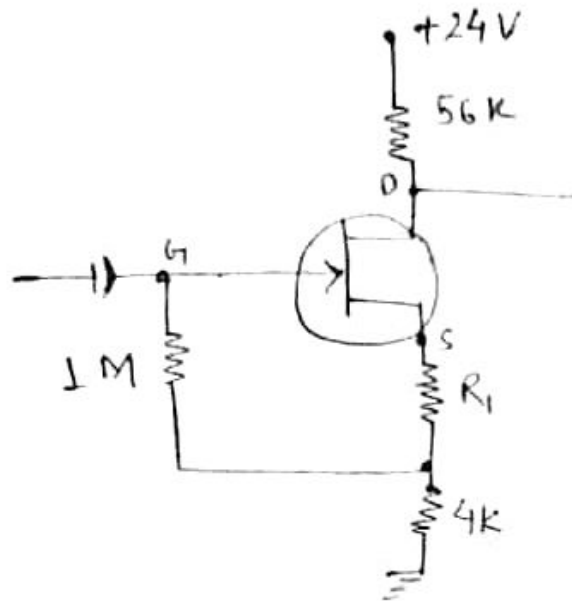


- (d) If $\beta = 100$, determine whether silicon transistor is operated in cut off, saturation or Active Region.



Unit-IV

4. (a) Why FET are called unipolar devices and BJT as bipolar device.
- (b) Explain the static R transfer characteristics of JFET?
- (c) The amplifier stage shown uses an n-channel FET having $I_{DSS} = 1mA$, $V_p = -1V$. If the quiescent drain-to-ground voltage is 10 V, find R.



(d) Prove that, for the JFET

$$g_m = g_{m0} \left[1 - \frac{V_{GS}}{V_p} \right]$$

Unit-V

5. (a) Why is MOS transistor device are commercially more important than JFET?

- (b) Explain potential divider bias for E-MOSFET with the help of dircuit diagram.
- (c) Write a short note on CMOS device.
- (d) Explain MOSFET as a switch

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B. Tech. (Third Semester) Examination

Nov.-Dec. 2023

(New Scheme)

(Electronics & Telecommunication Engineering Branch)

DIGITAL SYSTEM DESIGN

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Each question part (a) carries 4 marks and from Part (b), (c) and (d) carries 8 marks. Part (a) is compulsory from each unit. Attempt any **two** parts from (b), (c) and (d) on each question.*

Unit-I

I. (a) Convert the following problems :

- (i) Convert 1101100010101001.1101_2 to octal, to hexadecimal.

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- (ii) Convert $FECA_{16}$ to binary then to octal.
- (b) Explain :
- (i) Excess-3 code
 - (ii) Gray code
 - (iii) Binary to Gray code
 - (iv) The 8421 BCD code
- (c) Simplify the following Boolean expression using
- (i) $(A+C)(AD+AD') + AC + C = A+C$
 - (ii) $A + A'B + A'B'C + A'B'C'D + A'B'C'D'E'$
 $= A + B + C + D + E$
 - (iii) $AB + A'C + BC = AB + A'C$
 - (iv) $A'(A+B) + B(B+AA)(A+B') = A+B$
- (d) Write short notes on :
- (i) Demorgan's Theorem
 - (ii) Transposition Theorem

Unit-II

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2. (a) Explain SOP forms and POS forms with example.
- (b) Simplify the following using Tabular Method
 $D = f(a, b, c, d) = \sum(0, 1, 2, 3, 6, 7, 8, 9, 14, 15)$
- (c) Simplify the following using Karnaugh map :
- (i) $F = f(a, b, c, d) = \sum(2, 3, 4, 5, 13, 15) +$
 $\sum d(8, 9, 10, 11)$
 - (ii) $S = f(a, b, c, d) = \sum(1, 3, 4, 5, 7, 8, 9, 11, 15)$
- (d) Explain programmable Logic devices with example.

Unit-III

3. (a) Write difference between encoder and decoder.
- (b) Explain Parity Bit Generator / Checkers with example.
- (c) Explain different types of shift register with example
- (d) Explain JK flip flop and SR flip flop with logic diagram and Truth Table

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Unit-IV

4. (a) Differentiate between Mealy and Moore model.
- (b) What is counter? Design of Modulo-9 Synchronous counter.
- (c) What is Algorithmic state machines charts? List the silent features of the ASM charts?
- (d) Explain serial adder working with the help of state diagrams and state table?

Unit-V

5. (a) Difference between Fan-in and Fan-out?
- (b) Explain the working of a two-input TTL NAND gate with Totem pole output.
- (c) Detail description of TTL subfamilies.
- (d) Explain the working IIL NAND and NOR gates with a neat diagram.

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B. Tech. (Third Semester) Examination,

Nov.-Dec. 2023

(New Scheme)

(Electronics and Telecommunicaton Engg. Branch)

NETWORK THEORY

(BT-3028)

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

Note : Attempt all questions. Part (a) of each question is compulsory and carries 4 marks. Solve any **two** parts from part (b), (c) & (d) and carries 8 marks each. Assume suitable data if needed.

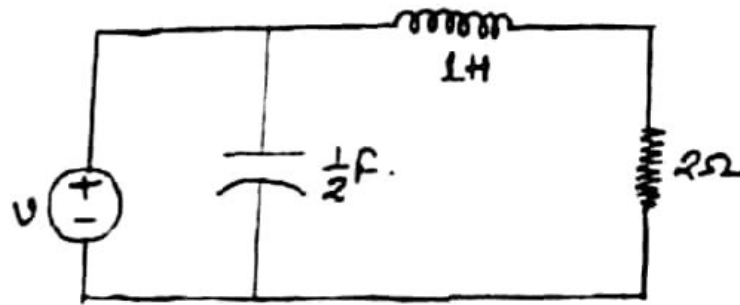
Unit-I

1. (a) What is the condition for transfer of maximum power?

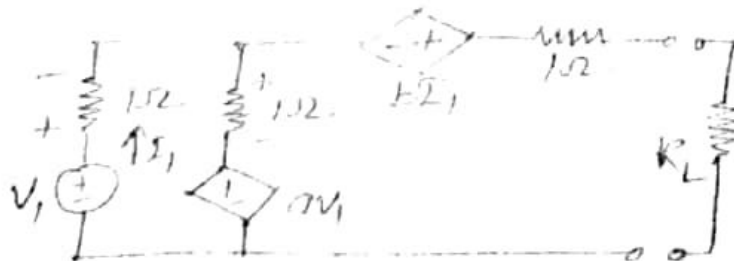
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(b) The network shown in below figure is operated in the sinusoidal steady state, with the element values given and $i = 100 \cos 2t$. Determine :

- (i) The complex power delivered by the source.
- (ii) The effective current in each of the passive elements.



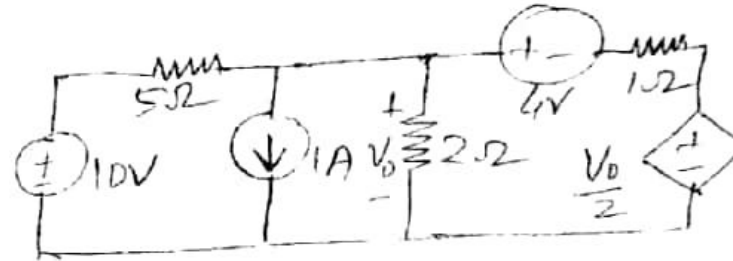
(c) For the network shown, show that the equivalent thevenin's network is represented by :



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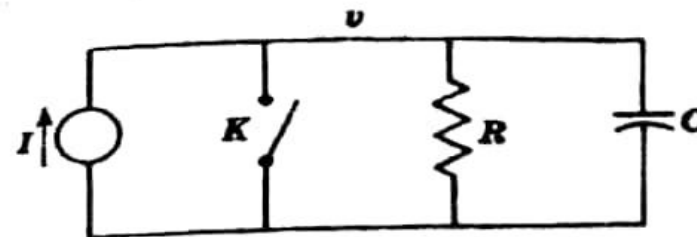
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(d) Apply superposition theorem and calculate V_0 in the given circuit :



Unit-II

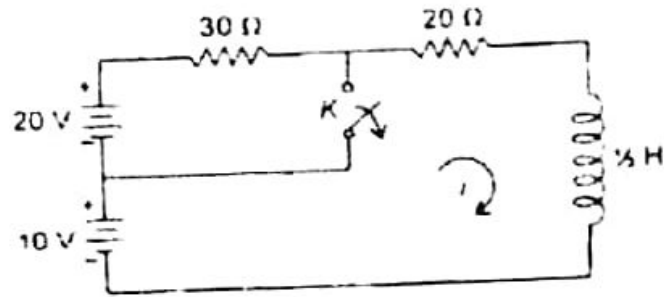
2. (a) What do you understand by transient and steady state response?
- (b) In the circuit shown, the switch K is opened at $t = 0$. At $t = 0+$, calculate v , dv/dt and d^2v/dt^2 .
If $I = 10 \text{ A}$, $R = 1000 \Omega$, $C = 1 \mu\text{F}$.



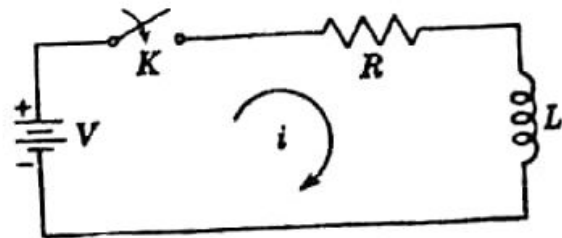
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- (c) The network of the figure reaches a steady state with the switch K open. At $t = 0$ the switch K is closed. Find $i(t)$ for numerical values given sketch the current waveform. Also indicate the value of time constant.



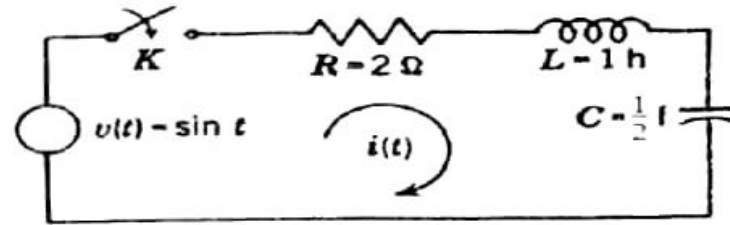
- (d) In the circuit of below figure the switch K is closed at $t = 0$, solve for the values of i , di/dt and d^2i/dt^2 at $t = 0+$, If $V = 100$ V, $R = 10\Omega$, $L = 1$ H.



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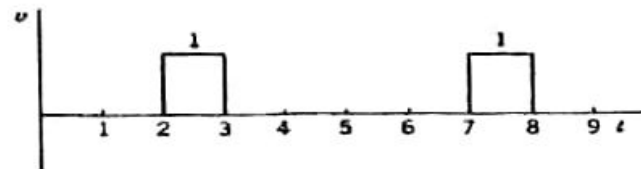
Unit-III

3. (a) What is initial and final value theorem?
 (b) In the series R-L-C circuit shown, the applied voltage is $V(t) = \sin t$ for $t > 0$. For the elements values, given, find $i(t)$. If the switch is closed at $t = 0$.



- (c) Write an equation for the nonrecurring waveform shown in below figures in terms of unit step functions :

(i)

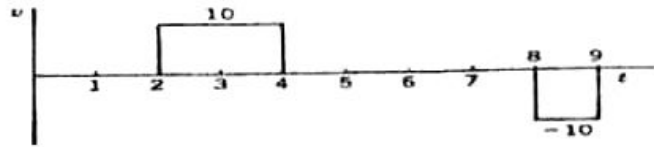


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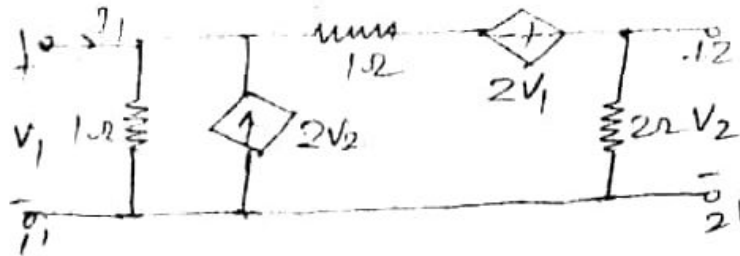
(ii)



- (d) Derive the expression for unit step response of R-L circuit and sketch the waveform of current $i(t)$.

Unit-IV

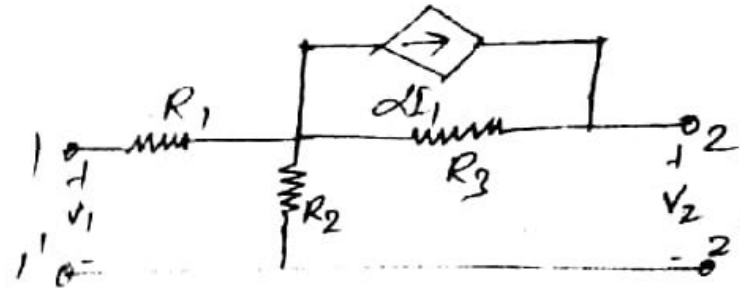
4. (a) Write down the formula for conversion of z parameters into y parameters.
 (b) Find out the Y and Z parameters for the given network :



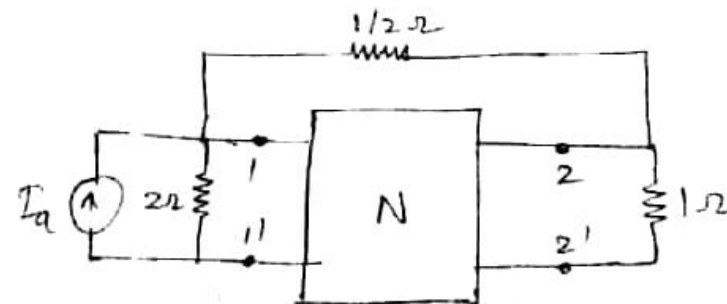
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- (c) For the figure shown find the value of h parameters :



- (d) For the network shown below, $y_{11} = y_{21} = y_{22} = 2$ mho, and $y_{12} = 1$ mho, and constant current source $I_a = 1$ Amp. Determine V_1 and V_2 .

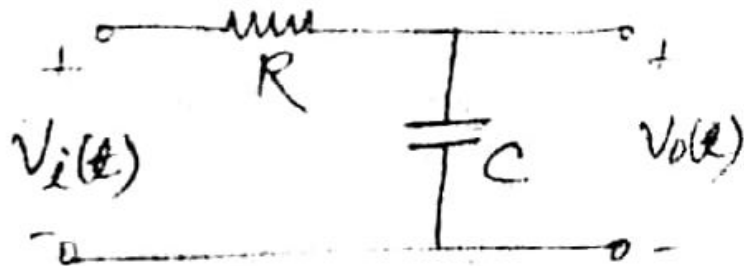


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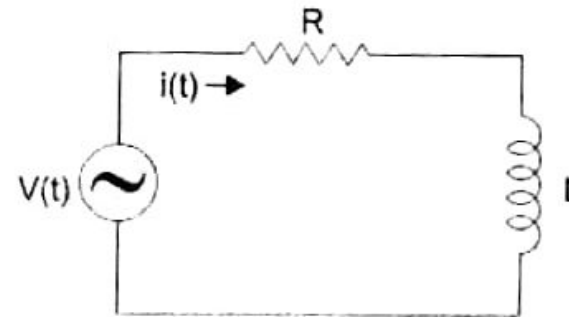
Unit-V

5. (a) Explain the difference between AC and DC transient analysis.
- (b) For the circuit shown in below figure, the time constant $RC = 1$ ms. The input voltage $V_i(t) = \sqrt{2} \sin 10^3 t$? Find the output voltage $V_o(t)$.



- (c) Draw the phasor diagram of series RL, RC and RLC circuit.
- (d) Explain the steps to be followed to find the steady state value of the current $i(t)$ in a given RL circuit

if $V(t) = V \cos \omega t$, where V is positive real constant.



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**B. Tech. (Third Semester) Examination,
Nov.-Dec. 2023**

(Electronics and Telecommunication Engg. Branch)

DATA STRUCTURES USING C++

Time Allowed : Three hours

Maximum Marks : 100

Minimum Pass Marks : 35

*Note : Part (a) of each question is compulsory & carry 4 marks. Attempt any **two** parts from (b), (c) and (d) and carry 8 marks.*

Unit-I

- I. (a) Enlist the benefits of object oriented programming. 4
- (b) What is the use of private member function? Illustrate

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- how a private member function can be called using a appropriate example 8
- (c) Write a C++ program to keep record of 100 students. The record should have student name and student roll numbr use functions to input the student record and to display the student record 8
- (d) What do you understand by friendly function? Write a program to swap two values, each declared in two diferent class using the concept of friendly function 8

Unit-II

2. (a) What is the need of operator overloading? 4
- (b) Explain binary operator overloading using friends function with a suitable example 8
- (c) What do you understand by single inheritance? Write a program in C++ to add two numbers using single inheritance where the numbers are given in base class and derived class adds the numbers and displays the result. 8

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- (d) What is the need and importance of virtual base class? Use an appropriate example to elaborate the concept 8

Unit-III

3. (a) What do you understand by pointer and pointer to pointer? 4
- (b) Write a program in C++ using pointer to read an array of 10 numbers and print the numbers incrementing every number by 1. 8
- (c) What is the need of virtual function? How is it different from pure virtual function? 8
- (d) Illustrate how pointers can be used in derived classes using a suitable example. 8

Unit-IV

4. (a) What do you understand by stack and queue? 4
- (b) What is the difference between linear search and binary search? Write an algorithm for binary search and explain it. 8

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- (c) Write an algorithm for bubble sort and explain it with a suitable example. 8
- (d) Write an algorithm to perform insertion and deletion in a circular queue. 8

Unit-V

- 5. (a) Illustrate how does a link list differs from an array. 4
- (b) Explain the various tree traversal techniques. 8
- (c) Illustrate how a binary search tree can be used to search a given value using an appropriate example. 8
- (d) What is the use of graph? What are the different traversal techniques used in graphs. 8