# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: Problem Solving using C
Course Code: 24BEPHY104/24BEELY105 Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | Module 1 | | | |
| 1 a. | Explain rules to construct identifier. Classify the following as valid /invalid variables. i) num2 ii) $num1 iii) _apple iv) 12num | 06 | L1,L3 | CO1 |
| b. | What is the difference between keywords and identifiers? | 06 | L5 | CO1 |
| c. | Define Algorithm? Write an algorithm to find largest among 3 numbers | 08 | L2 | CO2 |
| | OR | | | |
| 2 a. | Explain the classification of software with examples. How is system software different from application software? | 08 | L3 | CO1 |
| b. | Define modular programming and structured programming. How do they help in software development? Illustrate with an example. | 06 | L2 | CO1 |
| c | Explain the concept of C tokens. List and describe different types of tokens with examples. | 06 | L3 | CO1 |
| | Module 2 | | | |
| 3 a. | Differentiate between formatted and unformatted input/output functions in C with examples. | 10 | L5 | CO2 |
| b. | Explain the use of formatted I/O functions in C. Write a program that accepts name, age, and salary of an employee and displays the data using formatted output. | 05 | L3 | CO2 |
| c. | Differentiate between while () loop and do..while () loop. | 05 | L5 | CO2 |
| | OR | | | |
| 4 a. | Explain different types of decision-making statements in C. Write a program using if, if-else, and nested if statements to find the largest among three numbers. | 10 | L3 | CO2 |
| b. | Explain Conditional and unconditional statements used in C. | 05 | L3 | CO2 |
| c. | Write a C program using the ternary operator to find the minimum of two numbers. Explain how the ternary operator works with syntax. | 05 | L4 | CO2 |
| | Module 3 | | | |
| 5 a. | What is an array? How is a one-dimensional array declared and initialized in C? | 06 | L1 | CO3 |
| b. | Write a C program to find the sum and average of elements in a one-dimensional array. | 06 | L4 | CO3 |
| c. | Explain the concept of two-dimensional arrays in C. Write a C program to add two 3×3 matrices. | 08 | L3 | CO3 |
| | OR | | | |
| 6 a. | Explain various operations on strings in C. Write a C program to perform string copy, concatenation, and comparison using built-in functions. | 06 | L3 | CO3 |
| b. | Write a C program to illustrate the use of static and register variables. Explain how their behavior differs from auto variables. | 06 | L4 | CO3 |
| c. | Compare and contrast auto, static, and extern storage classes in terms of scope, lifetime, and default values. | 08 | L5 | CO3 |
| | Module 4 | | | |
| 7 a. | What is a function in C? Explain function definition, declaration (prototyping), and function call with an example. | 10 | L3 | CO4 |

| | | | | |
|---|---|---|---|---|
| b. | What is recursion? Write a recursive function in C to find the Fibonacci series up to n terms. Explain how recursion works. | 06 | L3 | CO4 |
| c. | What are macros in C? Differentiate between object-like and function-like macros. Write examples of each using #define. | 04 | L5 | CO4 |
| | OR | | | |
| 8 a. | Differentiate between call by value and call by reference with suitable examples. | 10 | L5 | CO4 |
| b. | Define pointers. How are they declared and used in C? Explain pointer arithmetic with examples. | 06 | L1 | CO4 |
| c. | Explain static and dynamic memory allocation in C. | 04 | L3 | CO4 |
| | Module 5 | | | |
| 9 a. | Explain how to declare and initialize a structure in C. | 05 | L3 | CO5 |
| b. | What are nested structures? Write a program to store and display employee information using nested structures. | 08 | L1 | CO5 |
| c. | Compare structures and unions. Highlight their differences with examples. | 07 | L5 | CO5 |
| | OR | | | |
| 10 a. | Differentiate between text files and binary files. Explain their advantages and write a sample program to write and read a structure to a binary file. | 05 | L5 | CO5 |
| b. | Write a C program to copy contents of one text file to another using file handling functions. | 08 | L4 | CO5 |
| c. | What are different file modes in C? Explain each mode (r, w, a, rb, wb, etc.) with examples of usage. | 07 | L2 | CO5 |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Programming in Python**
Course Code: **24BEELY205/24BEPHY204** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Explain the basic data types in Python with examples. | **06** | **L2** | **CO1** |
| **b.** | Define conditional statements. Write the syntax of if-elif-else with an example | **06** | **L2** | |
| **c.** | Write a Python program to display the multiplication table of a number using a loop. | **08** | **L3** | |
| | OR | | | |
| **2 a.** | Define a loop. Compare for and while loops in Python. | **06** | **L2** | **CO1** |
| **b.** | Explain the use of break and continue statements with examples. | **06** | **L2** | |
| **c** | Program to find the sum of all even numbers from 1 to N using a for loop | **08** | **L3** | |
| | **Module 2** | | | |
| **3 a.** | Define a function in Python. Explain the use of parameters with an example. | **06** | **L2** | **CO2** |
| **b.** | Explain default and keyword arguments? Explain with examples. | **06** | **L2** | |
| **c.** | Write a Python program using a function to check whether a number is prime or not. | **08** | **L3** | |
| | **OR** | | | |
| **4 a.** | Define a lambda function. How is it different from a regular function? | **06** | **L2** | **CO2** |
| **b.** | Explain the use of map () and filter () with lambda expressions. Give examples. | **06** | **L2** | |
| **c.** | Write a lambda function to find the square of all numbers in a list and print the result. | **08** | **L3** | |
| | **Module 3** | | | |
| **5 a.** | Compare lists, sets, and tuples with examples. Mention one use case for each | **06** | **L2** | **CO3** |
| **b.** | Explain any four list or set methods with examples | **06** | **L2** | |
| **c.** | Write a program to remove duplicate elements from a list using a set. | **08** | **L3** | |
| | **OR** | | | |
| **6 a.** | What is the difference between mutable and immutable sequences in Python? Explain with respect to lists and tuples. | **06** | **L2** | **CO3** |
| **b.** | Explain the use of slicing and indexing in tuples with examples. | **06** | **L2** | |
| **c.** | Write a Python program to find the union and intersection of two sets. | **08** | **L3** | |
| | **Module 4** | | | |
| **7 a.** | Define a dictionary. How are key-value pairs accessed and manipulated in Python? | **06** | **L2** | **CO4** |
| **b.** | Differentiate between mutable and immutable data types with examples. | **06** | **L2** | |
| **c.** | Write a program to reverse a string and check whether it is a palindrome. | **08** | **L3** | |
| | **OR** | | | |
| **8 a.** | Explain any four string methods with suitable examples. . | **08** | **L2** | |
| **b.** | Explain string slicing methods with an example. | **04** | **L2** | |

| | | | | |
|---|---|---|---|---|
| **c.** | Write a program to check whether a given string is a palindrome or not | **08** | **L3** | **CO4** |
| | **Module 5** | | | |
| **9 a.** | Explain the concept of file handling in Python. What are the different file modes? | **06** | **L2** | **CO5** |
| **b.** | Explain the use of the with statement in file handling with an example. | **06** | **L2** | |
| **c.** | Write a Python program to read a text file and count the number of lines and characters. | **08** | **L3** | |
| | **OR** | | | |
| **10 a.** | Define regular expressions. Mention any four functions from the re module with examples. | **06** | **L2** | **CO5** |
| **b.** | Explain metacharacters in regular expressions and the use of ^, $, \d, and. with examples. | **06** | **L2** | |
| **c.** | Write a Python program to extract all mobile numbers (10-digit) from a given text using regular expressions. | **08** | **L3** | |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Fundamentals of Data Science**
Course Code: **24BEELY207** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

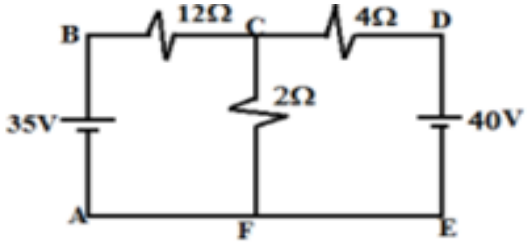
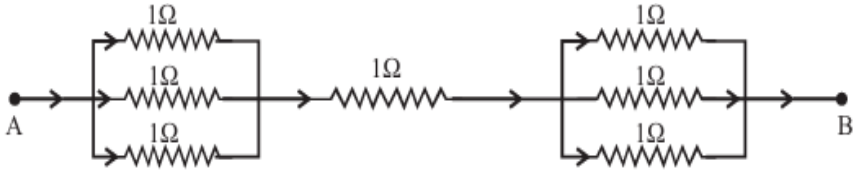
Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Define Big data, state applications of Big Data and explain any two applications in detail. | **08** | L2 | CO1 |
| **b.** | Discuss the role of data science in housing market analysis with the help of case study. | **06** | L2 | CO1 |
| **c.** | Describe each step of Exploratory Data Analysis in detail. | **06** | L2 | CO1 |
| | **OR** | | | |
| **2 a.** | Name and explain the types of Big-data. | **08** | L2 | CO1 |
| **b.** | Explain Data Science process steps in detail with block diagram. | **06** | L2 | CO1 |
| **c** | Explain Data warehouse with diagram in detail. | **06** | L2 | CO1 |
| | **Module 2** | | | |
| **3 a.** | Classify Measures of Central Tendency and explain in detail with example. | **08** | L2 | CO2 |
| **b.** | Calculate the Population standard deviation and Sample deviation for the score of the given dataset: 10,8,5,0,1,7,9,2,1. | **08** | L3 | CO2 |
| **c.** | Describe the Data Cleaning steps and explain. | **04** | L2 | CO2 |
| | **OR** | | | |
| **4 a.** | What is Correlation and Regression? Classify types of Correlation and show them with appropriate diagram. | **08** | L2 | CO2 |
| **b.** | Define Mean, Mode, Median. Calculate the mean, mode, median for the following data sets: 45,55,60,60,63,63,63,63,65,65,70. | **08** | L3 | CO2 |
| **c.** | Explain the concept and application of Crowdsourcing. | **04** | L2 | CO2 |
| | **Module 3** | | | |
| **5 a.** | Discuss any three types of Sampling from Distributions in detail. | **10** | L2 | CO3 |
| **b.** | Define Z-score and Calculate the Z-score for a given data set:<br>X = {40, 55, 60, 75, 90, 105, 110, 125} | **10** | L3 | CO3 |
| | **OR** | | | |
| **6 a.** | Classify mathematical models and explain any three models in detail. | **10** | L2 | CO3 |
| **b.** | Explain the concept of Robust scaling to normalize the dataset and apply on given dataset: X = {20, 25, 30, 35, 40, 45, 50}. | **10** | L3 | CO3 |
| | **Module 4** | | | |
| **7 a.** | List and explain the key design principles involved in data visualization. | **10** | L2 | CO4 |
| **b.** | Describe a Box Plot and its key components using a clearly labelled diagram with explanation. | **10** | L2 | CO4 |
| | **OR** | | | |
| **8 a.** | What is Data visualization? Explain the steps involving in the Data Visualization. | **10** | L2 | CO4 |
| **b.** | Describe a Scatter plot and line chart, illustrate its example with diagram. | **10** | L2 | CO4 |
| | **Module 5** | | | |
| **9 a.** | Write the concept of Data Engineering and Explain the task performed by data engineers. | **10** | L2 | CO5 |
| **b.** | Illustrate the architecture of MapReduce technique with an example. | **10** | L2 | CO5 |
| | **OR** | | | |
| **10 a.** | Describe network theory with the explanation of Network's basic components and write applications of Social Network Analysis. | **10** | L2 | CO5 |
| **b.** | Explain Clustering of graphs in detail with its types and supporting diagram. | **10** | L2 | CO5 |

# School of Engineering & Technology – SNPSU
## Model Question Paper (2024 scheme)

Course Name: Basics of Electrical & Electronics Engineering
Course Code: 24BEELY104/24BEELY204 Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | State and explain Ohms law and its limitations. | **06** | **L2** | **01** |
| **b.** | For the circuit shown in figure (1).Find the current in the 2Ω resistor.<br>  <br>Figure(1) | **08** | **L3** | **01** |
| **c.** | Given a circuit with resistors connected between points A and B as shown in figure(2), apply the rules of series and parallel combinations to determine the total effective resistance between the two points.<br>  <br>Figure(2) | **06** | **L3** | **01** |
| | **OR** | | | |
| **2 a.** | Analyze the behavior of a series RLC circuit powered by a 230V, 50Hz AC supply, consisting of a 0.06 H inductor, 2.5Ω resistor, and a 6.8μF capacitor. Break down the circuit to (i).Determine the overall impedance by analyzing the reactance's of the inductor and capacitor. (ii)Calculate the resulting current flowing through the circuit. (iii).Examine the phase relationship between voltage and current to find the phase angle. (iv)Analyze the power factor and its implication on circuit efficiency. (v)Evaluate the real power consumed in the circuit. | **08** | **L3** | **01** |
| **b.** | With phasor diagram obtain the voltage, current relations in pure inductive circuit and also show that average power consumed in inductive circuit is zero. | **06** | **L3** | **01** |
| **c** | Define the following by referring a sine wave i) RMS value ii) Average value iii)phase difference. | **06** | **L2** | **01** |
| | **Module 2** | | | |
| **3 a.** | Discuss the advantages of single phase circuit over a three phase circuit. | **06** | **L2** | **02** |
| **b.** | Prove that the emf equation of d.c generator is given by E=P·Φ·Z·N/60. A | **06** | **L3** | **02** |
| **c.** | A balanced Delta connected load of (10+j8) phase is connected to a 3 phase, 400V, and 50 Hz supply. Find :(i) Line current, (ii) Power factor, (iii) Power, (iv) Reactive volt amperes. | **08** | **L3** | **02** |
| | **OR** | | | |
| **4 a.** | With a neat diagram explain the working and construction of d.c motor. | **10** | **L2** | **02** |
| **b.** | Derive the expression of armature torque developed in a dc motor. | **05** | **L3** | **02** |
| **c.** | Define transformer? Derive an e.m.f equation of transformer with usual notation. | **05** | **L2** | **02** |
| | **Module 3** | | | |

| | | | | |
|---|---|---|---|---|
| **5 a.** | What is a PN junction diode? With a neat diagram explain the forward and reverse characteristics of PN junction diode? | **10** | **L2** | **03** |
| **b.** | With an appropriate circuit explain how zener diode can be used as voltage regulator? | **10** | **L2** | **03** |
| | **OR** | | | |
| **6 a.** | With necessary waveforms and circuit diagram explain the working of a full wave rectifier circuit. | **10** | **L2** | **03** |
| **b.** | Write a short note on photodiodes and mention its applications. | **05** | **L2** | **03** |
| **c.** | Mention the differences between half wave and full wave rectifiers. | **05** | **L2** | **03** |
| | **Module 4** | | | |
| **7 a.** | Describe in detail the working of a NPN bipolar junction transistor. | **10** | **L2** | **04** |
| **b.** | Discuss with neat diagrams the Common Emitter Configuration also draw the I/O characteristics of CE configuration. | **06** | **L2** | **04** |
| **c.** | Find the value of $\beta$ if (i) $\alpha = 0.9$ (ii) $\alpha = 0.98$ | **04** | **L2** | **04** |
| | **OR** | | | |
| **8 a.** | With a neat circuit diagram explain how the transistor can be used as an amplifier. | **10** | **L2** | **04** |
| **b.** | Define positive and negative feedback? List four basic types of feedback? What are the advantages of negative feedback? | **10** | **L2** | **04** |
| | **Module 5** | | | |
| **9 a.** | Design Half Adder circuit and implement it using only NAND gates. | **06** | **L3** | **05** |
| **b.** | Prove that:<br>(i) A+A'B+AB'=A+B<br><br>(ii) AB+A'B+A'B'=A'+B and realize it using only basic gates. | **06** | **L3** | **05** |
| **c.** | Define universal gates? Realize OR, AND, NOT and NOR gates using NAND gates only. | **08** | **L2** | **05** |
| | **OR** | | | |
| **10 a.** | Design and implement a 4:1 Multiplexer using basic logic gates. | **08** | **L3** | **05** |
| **b.** | Illustrate the working of JK flip flop with the help of truth table and logic diagram. | **06** | **L2** | **05** |
| **c.** | Draw the block diagram of a communication system and explain its components in detail. | **06** | **L2** | **05** |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Engineering Physics**
Course Code: **24BEPHY203** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Set up an expression for Time Independent Schrodinger's wave equation. | 08 | L2 | 1 |
| **b.** | Deduce an expression for energy Eigen value and Eigen function for a particle in one dimensional a box. | 07 | L2 | 4 |
| **c.** | An electron has a velocity of 4.8 x $10^5$ m/s accurate to 0.012%. With what accuracy can the position of electron be located? (Given: h = $6.625x10^{-34}$ Js, m = $9.1x10^{-31}$kg, c = $3x10^8$m/s) | 05 | L3 | 1 |
| | **OR** | | | |
| **2 a.** | What are Eigenvalues and Eigen Functions give example? Explain Heisenberg's uncertainty principle. | 08 | L2 | 1 |
| **b.** | Briefly explain Probability density & Normalization of Wave Function. | 07 | L2 | 1 |
| **c** | Calculate the energy in eV for electron with de Broglie wavelength of 10nm. (Given: h = $6.625x10^{-34}$ Js, m = $9.1x10^{-31}$kg, e = $1.6x10^{-19}$ $C$) | 05 | L3 | 1 |
| | **Module 2** | | | |
| **3 a.** | Define electric dipole and dipole moment | 04 | L2 | 3 |
| **b.** | Explain different types of polarization with neat diagram. | 08 | L2 | 3 |
| **c.** | Derive Clausius -Mossotti equation using internal field. | 08 | L2 | 3 |
| | **OR** | | | |
| **4 a.** | Discuss the failures of classical free electron theory | 06 | L2 | 3 |
| **b.** | Define Fermi function. Explain the variation of Fermi factor with temperature and energy | 09 | L2 | 3 |
| **c.** | Calculate the probability of an electron occupying energy level 0.11eV above the fermi level at temperature 293K in a material | 05 | L3 | 3 |
| | **Module 3** | | | |
| **5 a.** | Explain the position of Fermi level in intrinsic and extrinsic semiconductor. | 05 | L2 | 3 |
| **b.** | Explain Law of mass action and derive the relation between energy gap and Fermi energy. | 10 | L2 | 3 |
| **c.** | For intrinsic GaAs, the room temperature electrical conductivity is $10^{-6}$/Ωm; the electron and hole mobilities are respectively 0.85$m^2$/Vs and 0.04 $m^2$/Vs. Compute the intrinsic carrier concentration at room temperature. | 05 | L3 | 3 |
| | OR | | | |
| **6 a.** | What is Hall effect ? Derive an expression for Hall coefficient and mention any two applications of Hall effect. | 10 | L2 | 3 |
| **b.** | With neat diagram explain the four probe method to find the resistivity of a sample. | 05 | L2 | 3 |
| **c.** | The hall co-efficient of a specimen of a doped Si is found to be 3.66X$10^{-4}m^3$/C. The resistivity of the specimen is 8.93X$10^{-3}$Ωm. Find the mobility and density of the charge carrier, assuming single carrier conduction. | 05 | L3 | 3 |

| | | | | |
|---|---|---|---|---|
| | **Module 4** | | | |
| **7 a.** | What are superconductors? Explain Type I and Type II superconductors with examples. | 10 | L2 | 3 |
| **b.** | Give the acronym for SQUIDS. Explain the construction and working of DC SQUID. | 05 | L2 | 3 |
| **c.** | At the temperature of 6 K critical magnetic field is $5x10^3$ A/m, Calculate the transition temperature when a critical magnetic field is $2x10^4$ A/m. | 05 | L3 | 3 |
| | **OR** | | | |
| **8 a.** | What are Cooper pairs? Explain BCS Theory of Superconductors. | 08 | L2 | 3 |
| **b.** | Explain Meissner Effect with necessary theory and diagram. | 07 | L2 | 3 |
| **c.** | The critical field for lead is $1.2 \times 10^5$ A/m at 8 K and $2.4 \times 10^5$ A/m at 0 K. Find the critical temperature of the material. | 05 | L3 | 3 |
| | **Module 5** | | | |
| **9 a.** | Explain Pauli X and Y Gate with operation using matrix multiplication. | 08 | L2 | 2 |
| **b.** | What is Hadamard Gate? Write its matrix form, symbol and truth table. | 06 | L2 | 2 |
| **c.** | What is Toffoli gate? Write its matrix form and truth table. | 06 | L3 | 2 |
| | OR | | | |
| **10 a.** | What is CNOT Gate? Give its matrix form and truth table. Explain the operation of CNOT gate on $\|0\rangle$ and $\|1\rangle$ state. | 10 | L2 | 2 |
| **b.** | Give any Five Properties of Qubits | 05 | L1 | 2 |
| **c.** | What is Swap gate? Write its matrix form and truth table. | 05 | L2 | 2 |

SAPTHAGIRI NPS UNIVERSITY
UNMATCHED EXCELLENCE,UNLIMITED POTENTIAL

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 Scheme)

Course Name: **Computer Organization and Architecture**
Course Code: **24BEPHY105/24BEPHY205** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

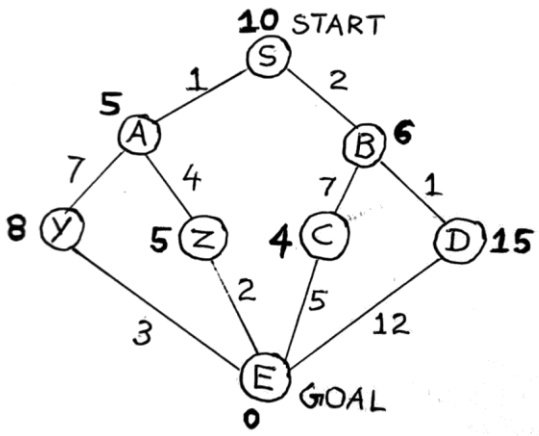
| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Explain the main components of a digital computer as depicted in the block diagram. | **06** | **L2** | **CO 1** |
| **b.** | Explain the addition and subtraction of signed magnitude data with hardware implementation. | **08** | **L2** | **CO 1** |
| **c.** | Perform the following conversions;<br>i) $(A46)_{16} = (?)_2$<br>ii) $(6523)_8 = (?)_{16}$<br>iii) $(10110100)_2 = (?)_{10}$ | **06** | **L3** | **CO 1** |
| | **OR** | | | |
| **2 a.** | Describe the BCD adder circuit with a neat block diagram. | **06** | **L2** | **CO 1** |
| **b.** | Explain Booth's multiplication algorithm with a float chart. | **08** | **L2** | **CO 1** |
| **c** | Perform the following subtractions;<br>i) $(5623)_{10} - (5363)_{10}$ using 10's complement.<br>ii) $(10110011)_2 - (10011001)_2$ using 2's complement. | **06** | **L3** | **CO 1** |
| | **Module 2** | | | |
| **3 a.** | What is Direct Memory Access? Describe the operation of DMA controller in a computer system. | **10** | **L2** | **CO 2** |
| **b.** | List the main components of an Input-Output interface and describe their functions. | **06** | **L2** | **CO 2** |
| **c.** | List the differences between Isolated I/O and Memory Mapped I/O. | **04** | **L3** | **CO 2** |
| | **OR** | | | |
| **4 a.** | What is priority interrupt in the context of I/O operation? How does a Daisy chain mechanism work to manage priority? | **08** | **L2** | **CO 2** |
| **b.** | Explain the concept of Memory Hierarchy and List the levels of the hierarchy from fastest to slowest. | **06** | **L2** | **CO 2** |
| **c.** | What is Asynchronous Data Transfer? How does the strobe control mechanism work in asynchronous data transfer? | **06** | **L3** | **CO 2** |
| | **Module 3** | | | |
| **5 a.** | Define micro programmed control and discuss its types. | **06** | **L2** | **CO 3** |
| **b.** | Discuss the data manipulation instruction sets with examples? | **06** | **L3** | **CO 3** |
| **c.** | Illustrate any four addressing modes with examples. | **08** | **L3** | **CO 3** |
| | **OR** | | | |
| **6 a.** | Explain general register organization of CPU with a neat diagram. | **06** | **L2** | **CO 3** |
| **b.** | Discuss the data transfer instruction with example. | **06** | **L3** | **CO 3** |
| **c.** | Summarize the steps involved in address sequencing within micro programmed control unit with suitable diagram. | **08** | **L3** | **CO 3** |
| | **Module 4** | | | |
| **7 a.** | Explain types of arithmetic micro-operations with the help of neat diagram of the arithmetic circuit. | **10** | **L2** | **CO 4** |
| **b.** | Illustrate the list of registers for the basic computer. | **06** | **L3** | **CO 4** |

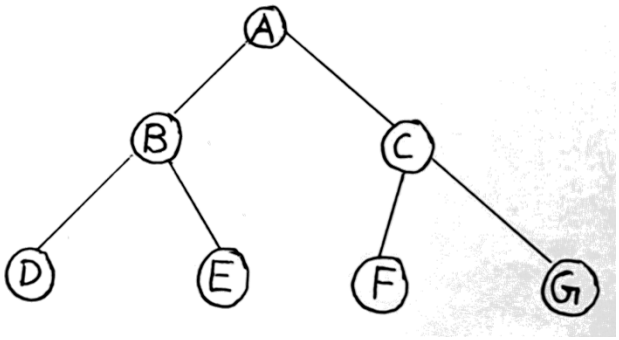
| | | | | |
|---|---|---|---|---|
| **c.** | Explain Register transfer with a block diagram and timing diagram. | **04** | **L3** | **CO 4** |
| | **OR** | | | |
| **8 a.** | Draw suitable diagram and explain the construction of common bus system using<br>i) Multiplexer.<br>ii) Tri state Buffer. | **08** | **L2** | **CO 4** |
| **b.** | Explain arithmetic logic shift unit with the help of a block diagram. | **08** | **L3** | **CO 4** |
| **c.** | Define program, instruction, instruction code and operation code. | **04** | **L2** | **CO 4** |
| | **Module 5** | | | |
| **9 a.** | Differentiate between the RISC and CISC. | **04** | **L2** | **CO 5** |
| **b.** | Demonstrate the pipeline organization for following example $A_i * B_i + C_i$ for i =1, 2, 3….. | **06** | **L3** | **CO 5** |
| **c.** | Define array processors? Explain SIMD array processor. | **10** | **L3** | **CO 5** |
| | **OR** | | | |
| **10 a.** | Define vector processing? List the application of vector processing. | **05** | **L2** | **CO 5** |
| **b.** | Write short notes on<br>i) time shared common bus and<br>ii) Multiport memory. | **05** | **L2** | **CO 5** |
| **c.** | Explain the parallel processing with multiple functions units with diagrams. | **10** | **L3** | **CO 5** |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Fundamentals of AI and ML**
Course Code: **24BEPHY106/24BEPHY206** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Identify four real-world applications of Artificial Intelligence. | **04** | **L2** | **CO1** |
| **b.** | Discuss how the Turing Test is used to evaluate machine intelligence. | **06** | **L2** | **CO1** |
| **c.** | Explain the concept of an agent and its environment in AI and describe the various types of environments. | **10** | **L2** | **CO1** |
| | OR | | | |
| **2 a.** | Interpret the statement "AI is a boon or a curse" in the context of present-day applications. | **04** | **L2** | **CO1** |
| **b.** | Compare and contrast the following intelligent agents.<br>i) Simple reflex agent, Model based reflex agent<br>ii) Utility based agent, Goal based agent | **06** | **L2** | **CO1** |
| **c** | Review about the four dimensions of Artificial Intelligence with example. | **10** | **L2** | **CO1** |
| | **Module 2** | | | |
| **3 a.** | Describe the following terms:<br>i. Heuristic function<br>ii. Optimality | **04** | **L2** | **CO2** |
| **b.** | Discuss how Iterative Deepening Depth First Search works with the help of an example. | **06** | **L2** | **CO2** |
| **c.** | Assume that a tourist want to travel from a city named Sivajinagar(S) to another city named Ekapur(E). The figure shows the roadmap between various cities, where city is represented using its first letter. The numbers marked in Figure represent the distance between the cities in Kilometers and the minimum time(in hours) required to travel from each city to E is mentioned in bold letters. Apply A* algorithm to find the optimal path from S to E.<br>  <br> | **10** | **L3** | **CO2** |
| | **OR** | | | |

| | | | | |
|---|---|---|---|---|
| **4 a.** | Summarize about Uniform Cost Search with an example | **04** | **L2** | **CO2** |
| **b.** | Outline various hill climbing algorithms. | **06** | **L2** | **CO2** |
| **c.** | Demonstrate the Depth-First Search algorithm with advantages and disadvantages. Apply the Depth-First Search (DFS) algorithm to determine a path from node A to node G in the given below graph.   | **10** | **L3** | **CO2** |
| | **Module 3** | | | |
| **5 a.** | Apply the syntax and semantics of Propositional Logic to translate the following English statements into propositional logic formulas:<br>i) If it rains, then the ground is wet.<br>ii) Either the switch is off or the machine is not working. | **04** | **L3** | **CO3** |
| **b.** | Restate the procedure followed in resolution for logical inference. | **06** | **L2** | **CO3** |
| **c.** | Extrapolate the concept of Knowledge Engineering in First-Order Logic by modeling a digital circuit. | **10** | **L2** | **CO3** |
| | **OR** | | | |
| **6 a.** | Construct an appropriate First-Order Logic expression for the given natural language sentence.<br>i. "Some Indians speak French"<br>ii. "All kids like chocolate" | **04** | **L3** | **CO3** |
| **b.** | Illustrate the concept and architecture of a knowledge-based agent. | **06** | **L2** | **CO3** |
| **c.** | Explain the components of First-Order Logic using appropriate examples for constants, variables, predicates, functions, and quantifiers. | **10** | **L2** | **CO3** |
| | **Module 4** | | | |
| **7 a.** | Assume that you have received a job offer. Construct a decision tree to help you decide whether to accept the offer or not. | **04** | **L3** | **CO4** |
| **b.** | Differentiate the following with suitable examples.<br>i) Linear Regression ii) Logistic Regression | **06** | **L2** | **CO4** |
| **c.** | Review the following terms with real life application:<br>i) Supervised Learning<br>ii) Unsupervised Learning<br>iii) Reinforcement Learning | **10** | **L2** | **CO4** |
| | **OR** | | | |
| **8 a.** | Given a dataset of images containing both Fennec foxes and cats, apply a suitable machine learning algorithm to identify the image. Justify your selection based on the characteristics of the data and the algorithm. | **04** | **L3** | **CO4** |
| **b.** | Contrast regression and classification in machine learning with appropriate examples | **06** | **L2** | **CO4** |
| **c.** | Rephrase the different stages of the Machine Learning Lifecycle. | **10** | **L2** | **CO4** |
| | **Module 5** | | | |

| | | | | |
|---|---|---|---|---|
| **9 a.** | Define the following terms:<br>i. Tokenization<br>ii Context-free-Grammer | **04** | **L1** | **CO5** |
| **b.** | Identify various applications of Natural Language Processing (NLP) and relate them to real-world scenarios. | **06** | **L2** | **CO5** |
| **c.** | Explain language model, its working process and applications | **10** | **L2** | **CO5** |
| | **OR** | | | |
| **10 a.** | State POS tagging. | **04** | **L1** | **CO5** |
| **b.** | Interpret the bag-of-words model and illustrate how it represents text data in Natural Language Processing. | **06** | **L2** | **CO5** |
| **c.** | Describe Parsing in NLP and the different types of Parsers with examples. | **10** | **L2** | **CO5** |

**School of Engineering & Technology - SNPSU**
**Model Question Paper (2024 scheme)**

Course Name: **COMPUTATIONAL MATHEMATICS**
Course Code: **24BEELY202/24BEPHY202** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Using Maclaurin's series expand $log(secx)$ up to sixth degree terms. | **07** | L1, L2, L3 | **CO1** |
| **b.** | Find the radius of curvature of $x^3 + y^3 = 3axy$ at $\left(\frac{3a}{2}, \frac{3a}{2}\right)$ on it. | **07** | L1, L2 L3 | **CO1** |
| **c.** | Evaluate $\lim_{x\to 0}\left(\frac{a^x+b^x+c^x+d^x}{4}\right)^{\frac{1}{x}}$ | **06** | L1, L2, L3 | **CO1** |
| | **OR** | | | |
| **2 a.** | Using Maclaurin's theorem prove that $\sqrt{1+\sin 2x} = 1 + x - \frac{x^2}{2} - \frac{x^3}{6} + \frac{x^4}{24} \mp \cdots$ | **07** | L1, L2 L3 | **CO1** |
| **b.** | Find the radius of curvature of the curve $x = a\left[cost + logtan\left(\frac{t}{2}\right)\right], y = asint.$ | **07** | L1, L2, L3 | **CO1** |
| **c** | Evaluate $\lim_{x\to 0}\left(\frac{sinx}{x}\right)^{\frac{1}{x^2}}$ | **06** | L1, L2, L3 | **CO1** |
| | **Module 2** | | | |
| **3 a.** | Solve$(mz - ny)\frac{\partial z}{\partial x} + (nx - lz)\frac{\partial z}{\partial y} + (mx - ly) = 0.$ | **07** | L1, L2, L3 | **CO2** |
| **b.** | Solve $\frac{\partial^2 z}{\partial x^2} + 3\frac{\partial z}{\partial x} - 4z = 0$ given that $z = 1$ and $\frac{\partial z}{\partial x} = y$ when $x = 0$. | **07** | L1, L2, L3 | **CO2** |
| **c.** | Form the PDE by eliminating the arbitrary functions in the following: $\emptyset(x + y + z, x^2 + y^2 - z^2) = 0.$ | **06** | L1, L2, L3 | **CO2** |
| | **OR** | | | |
| **4 a.** | Solve: $(y^2 + z^2)p + x(yq - z) = 0.$ | **07** | L1, L2, L3 | **CO2** |
| **b.** | Solve $\frac{\partial^3 z}{\partial x^3} + 4\frac{\partial z}{\partial x} = 0$ given that $z = 0, \frac{\partial z}{\partial x} = 0, \frac{\partial^2 z}{\partial x^2} = 4$ when $x = 0$. | **07** | L1, L2, L3 | **CO2** |
| **c.** | Form the PDE by eliminating the arbitrary functions $lx + my + nz = \emptyset(x^2 + y^2 + z^2).$ | **06** | L1, L2, L3 | **CO2** |
| | **Module 3** | | | |
| **5 a.** | Find the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ by double integration. | **07** | L1, L2, L3 | **CO3** |
| **b.** | Evaluate by changing the order of integration $\int_0^\infty \int_x^\infty \frac{e^{-y}}{y} dydx.$ | **07** | L1, L2, L3 | **CO3** |
| **c.** | Express in terms of beta function and then evaluate using gamma function $\int_0^\infty \frac{dx}{\sqrt{x(1+x)}}$. | **06** | L1, L2, L3 | **CO3** |
| | **OR** | | | |

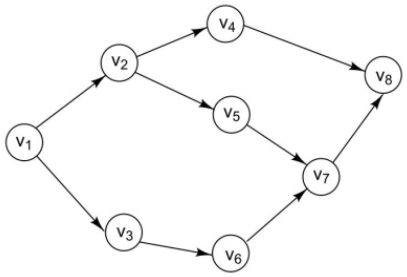
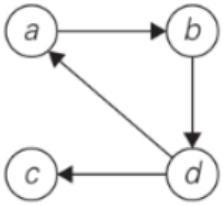
| | | | | |
|---|---|---|---|---|
| **6 a** | Find the volume generated by the revolution of the cardioid $r = a(1 + cos\theta)$ about the initial line. | **07** | L1, L2, L3 | **CO3** |
| **b.** | Evaluate by changing the order of integration $\int_{-2}^{2}\int_{0}^{\sqrt{4-x^2}}(2-x)\ dydx$ | **07** | L1, L2, L3 | **CO3** |
| **c.** | Prove that $\Gamma\left(\frac{1}{2}\right) = \sqrt{\pi}$. | **06** | L1, L2, L3 | **CO3** |
| | **Module 4** | | | |
| **7 a.** | Using Newton –Raphson method, find the root of $x\ log_{10}x = 1.2$ near 2.5. Carry out 3 Iterations. | **07** | L1, L2, L3 | **CO4** |
| **b.** | The Population of a town is given by the table<br>Year: 1951, 1961, 1971, 1981, 1991<br>Population in thousands: 19.19, 39.65, 58.81, 77.21, 94.64<br>Using Newton's forward and backward interpolation, calculate increase in population in 1955 to 1985. | **07** | L1, L2, L3 | **CO4** |
| **c.** | Find the root of the equation $f(x) = 2x^3 - 2x - 5$ by bisection method up to 5 iterations. | **06** | L1, L2, L3 | **CO4** |
| | **OR** | | | |
| **8 a.** | Find a real root of the equation $cosx - 3x + 1 = 0$, correct to 3 decimal places using Regula-Falsi method. | **07** | L1, L2, L3 | **CO4** |
| **b.** | The area A of a circle corresponding to the diameter (D) is given below:<br>D: 80, 85, 90, 95, 100<br>A: 5026, 5674, 6362, 7088, 7854<br>Find the area corresponding to the diameter 105 by using appropriate interpolation formula. | **07** | L1, L2, L3 | **CO4** |
| **c.** | Fit an interpolating formula for the data $u_{10} = 355,\ u_0 = -5,$ $u_8 = -21,\ u_1 = -14,\ u_4 = -125$. By using Newton's divided difference formula. | **06** | L1, L2, L3 | **CO4** |
| | **Module 5** | | | |
| **9 a.** | Apply Lagrange's formula inversely to find $x$ when $y = 6$ given the data<br>$x$: 20, 30, 40<br>$y$: 2, 4.4, 7.9 | **07** | L1, L2, L3 | **CO5** |
| **b.** | Evaluate $\int_0^{0.3}(1-8x^3)^{1/2}\ dx$ using Simpson's 3/8 th rule taking seven ordinates. | **07** | L1, L2, L3 | **CO5** |
| **c.** | Evaluate $\int_0^{\pi/2} cosx\ dx$ by applying Trapezoidal rule, taking eleven ordinates. | **06** | L1, L2, L3 | **CO5** |
| | **OR** | | | |
| **10 a.** | The following table gives the normal weights of babies during first eight months of life<br>Age (in months): 0, 2, 5, 8<br>Weight (pounds): 6, 10, 12, 16<br>Estimate the weight of the baby at the age of seven months using Lagrange's interpolation formula. | **07** | L1, L2, L3 | **CO5** |
| **b.** | Evaluate $\int_0^1 \frac{dx}{(1+x^2)}$ using Simpson's 1/3rd rule, dividing interval (0, 1) into six equal parts and hence find the approximate value of π. | **07** | L1, L2, L3 | **CO5** |
| **c.** | Use Weddle's rule $\int_0^1 \frac{dx}{(1+x)^2}$ taking 6 equal parts. | **06** | L1, L2,L3 | **CO5** |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Fundamentals of Data Structures**
Course Code: **24BEELY106/206** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Outline any two asymptotic notations used to measure the performance of algorithms. | **10** | **L2** | **1** |
| **b.** | Design and Develop a C program to add two matrices. | **06** | **L3** | **1** |
| **c.** | What is an array? What is the syntax of declaring an array? | **04** | **L1** | **1** |
| | **OR** | | | |
| **2 a.** | Describe the various types of data structures and their applications. | **10** | **L2** | **1** |
| **b.** | Write an algorithm to delete an element at position k in an array. | **06** | **L2** | **1** |
| **c** | Discuss how memory is allocated for 2D arrays in C. | **04** | **L2** | **1** |
| | **Module 2** | | | |
| **3 a.** | Implement a C function to insert an element at the end of a singly linked list. | **07** | **L3** | **3** |
| **b.** | What is a Stack? With a suitable example illustrate the various operations on a stack. | **07** | **L2** | **2** |
| **c.** | Describe the structure of a node in a doubly linked list. How is implemented in C. | **06** | **L2** | **3** |
| | **OR** | | | |
| **4 a.** | Develop a C function to delete a node whose value is specified in a doubly linked list. | **07** | **L3** | **3** |
| **b.** | Write a C program to implement Stack using arrays | **08** | **L3** | **2** |
| **c.** | Implement a C function to display contents of all nodes in a circular linked list. | **05** | **L3** | **3** |
| | **Module 3** | | | |
| **5 a.** | Define a Queue. Explain the different types of queues. | **06** | **L1** | **2** |
| **b.** | Write a C function to insert an element at the front of a double ended queue. | **06** | **L3** | **2** |
| **c.** | Write a C program to implement a linear queue using arrays. | **08** | **L3** | **2** |
| | **OR** | | | |
| **6 a.** | Develop a C program to implement a circular queue using arrays. | **10** | **L3** | **2** |
| **b.** | Differentiate linear queue and circular queue. | **04** | **L2** | **2** |
| **c.** | What is a priority queue? How is different from a normal queue. | **06** | **L2** | **2** |
| | **Module 4** | | | |
| **7 a.** | Write a C function to delete a element from a Binary Search Tree. | **08** | **L3** | **4** |
| **b.** | Define the following with an example<br>i. Strictly Binary tree<br>ii. Complete Binary tree<br>iii. Balanced Binary tree | **06** | **L1** | **4** |
| **c.** | Construct an Expression Tree for the following expression.<br>(a + b * c) +((d * e + f) * g). | **06** | **L3** | **4** |
| | **OR** | | | |
| **8 a.** | Construct a Binary Search Tree from the following elements by repeatedly inserting them into the BST.<br>45 65 25 55 75 35 15 40<br>Show the tree structure after each insertion. | **08** | **L3** | **4** |
| **b.** | Describe threaded binary trees with an example. | **05** | **L2** | **4** |
| **c.** | How can you sort a set of numbers using Binary Search Tree? Illustrate with an example to sort 6 or more numbers. | **07** | **L3** | **4** |
| | **Module 5** | | | |

| | | | | |
|---|---|---|---|---|
| **9 a.** | **40 20 60 10 30 50**<br>Sort the above elements and obtain the trace (step by step procedure) by applying Bubble Sort | **05** | **L3** | **5** |
| **b.** | Write an algorithm to perform Breadth First Search traversal on a graph. Obtain the BFS traversal on the following graph.<br>  | **07** | **L3** | **4** |
| **c.** | Write a C program to obtain the all pair shortest path matrix of a weighted graph. | **08** | **L3** | **4** |
| | **OR** | | | |
| **10 a.** | Write an algorithm to perform binary search on set of ordered elements. | **06** | **L2** | **5** |
| **b.** | For the given graph obtain the path matrix using Warshall's algorithm.<br>  | **06** | **L3** | **4** |
| **c.** | Write a C program to sort a list of elements using Selection Sort technique. | **08** | **L3** | **5** |

# School of Engineering & Technology - SNPSU
## Model Question Paper (2024 scheme)

Course Name: **Computer Aided Engineering And Graphics**
Course Code: **24BEPHY107/207** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1(Projection of Points and Lines)** | | | |
| 1 a. | Point 'A' is 30mm in front of VP, 20 mm above HP and 25mm from LPP. Draw its projections and name the side view. Also state the quadrant in which it lies. | 08 | L3 | 1,2,3 |
| b. | A line AB has its end "A" 20mm above the HP and 15mm in front of the VP. The other end "B" is 60mm above the HP and 45mm in front of the VP. The distance between the end projectors is 70mm. Draw its projections. Determine the true length and true inclination. Also determine the apparent lengths and inclinations | 12 | L3 | 1,2,3 |
| | **OR** | | | |
| 2 a. | Draw the projections of the following Points on the same XY line, keeping convenient distance between each projector. Name the quadrants in which they lie.<br>A- 30mm above HP and 35mm in front of VP.<br>**B-** B- 35mm above HP and 40mm behind VP.<br>**C-** C- 40mm below HP and 30mm behind VP.<br>**D-** D- 35mm below HP and 30mm in front of VP. | 08 | L3 | 1,2,3 |
| b. | A line AB 80mm long has its end "A" 20mm above the HP and 30mm in front of VP. It is inclined at 30°to HP and 45°toVP.Draw the projections of the line and find apparent lengths and apparent inclinations. | 12 | L3 | 1,2,3 |
| | **Module 2 (Projection of plane surfaces)** | | | |
| 3 | A 30°-60°set square of 60mm longest side is so kept such that the longest side is in HP, making an angle of 30° with VP. The setsquare itself is inclined at 45° to HP. Draw the projections of the setsquare | 15 | L3 | 1,2,3 |
| | **OR** | | | |
| 4 | A regular hexagonal lamina of sides 30 mm is lying in such a way that one of its sides on HP while the side opposite to the side on which it rests is on VP. If the lamina makes 60° to HP draw the projections of the lamina. | 15 | L3 | 1,2,3 |
| | **Module 3 (Projection of Solids)** | | | |
| 5 | A pentagonal prism 25mm sides of base and 60mm axis length rests on HP on one of its corner of the base such that the two base edges containing the corner on which it rests makes equal inclinations with HP. Draw the projections of the prism when the axis of the prism is inclined to HP at $40^0$ and appears to be inclined to VP at $45^0$. | 30 | L3 | 3,4 |
| | **OR** | | | |
| 6 | A square pyramid 35mm sides of base and 65mm axis length rests on HP on one of its edges of the base which is inclined to VP at $30^0$. Draw the projections of the pyramid when the axis is inclined to HP at $45^0$. | 30 | L3 | 3,4 |
| | **Module 4 (Development of Lateral Surfaces)** | | | |

| | | | | |
|---|---|---|---|---|
| 7 | Draw the development of the lateral surface of a truncated vertical cylinder, 40mm diameter of base and height 50mm, the truncated flat surface of the cylinder bisects the axis at 60° to it. | **15** | **L3** | 3,5 |
| | **OR** | | | |
| 8 | A rectangular prism of base 40mm x 25mm and height 65mm rests on HP on its base with the longer base side inclined at 30° to VP. It is cut by a plane inclined at 40° to HP, perpendicular to VP cuts the axis at its mid height. Draw the development of the remaining portion of the prism | **15** | **L3** | 3,5 |
| | **Module 5 (Isometric Projection)** | | | |
| 9 | A hemisphere of diameter 50mm is centrally resting on top of a square prism of base side 60mm and height 30mm such that the curved surface of hemisphere is touching the top face of the prism. Draw its isometric projections. | **20** | **L3** | 3,4 |
| | **OR** | | | |
| 10 | Draw the isometric projection of a hexagonal prism of side of base 40mm and height 60mm with a right circular cone of base 40 mm diameter and altitude 50mm, resting on its top such that the axes of both the sides are collinear | **20** | **L3** | 3,4 |

**School of Engineering & Technology - SNPSU**
**Model Question Paper (2024 scheme)**

Course Name: **LINEAR ALGEBRA & CALCULUS**
Course Code: **24BEPHY102/24BEELY102** Max. Marks: **100**
Batch: **2024-25** Exam Duration: **3 Hours**

Note: Answer **FIVE** full questions choosing one full question from each module. Each full question is for 20 marks

| Qno. | Question | Marks | RBT | CO |
|---|---|---|---|---|
| | **Module 1** | | | |
| **1 a.** | Find the Rank of the matrix $\begin{bmatrix} 91 & 92 & 93 & 94 & 95 \\ 92 & 93 & 94 & 95 & 96 \\ 93 & 94 & 95 & 96 & 97 \\ 94 & 95 & 96 & 97 & 98 \\ 95 & 96 & 97 & 98 & 99 \end{bmatrix}$. | **07** | L1, L2, L3 | **CO1** |
| **b.** | Find the largest eigenvalue and the corresponding eigenvector of the matrix $A = \begin{bmatrix} 4 & 1 & -1 \\ 2 & 3 & -1 \\ -2 & 1 & 5 \end{bmatrix}$ by Rayleigh's Power Method by taking the initial approximation to the eigen vector as $[1, 0.8, -0.8]^T$ . Perform 5 iterations. | **07** | L1, L2 L3 | **CO1** |
| **c.** | Solve the following system of equations by using Gauss Elimination Method<br>$3x + 4y + 5z = 18; 2x - y + 8z = 13; 5x - 2y + 7z = 20.$ | **06** | L1, L2, L3 | **CO1** |
| | **OR** | | | |
| **2 a.** | Solve the following system of equations by using Gauss Jordan method<br>$2x + 3y - z = 5; 4x + 4y - 3z = 3; 2x - 3y + 2z = 2.$ | **07** | L1, L2 L3 | **CO1** |
| **b.** | Find the largest eigenvalue and the corresponding eigenvector of the matrix $A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$ by Rayleigh's Power Method by taking the initial eigen vector as $[1,\ 1,\ 1]^T$ | **07** | L1, L2, L3 | **CO1** |
| **c** | Solve the following system of equations by using Gauss-Seidel Method $28x + 4y - z = 32;\ 2x + 17y + 4z = 35;\ x + 3y + 10z =$ 24. carryout 3 iterations correct to 3 decimal places. | **06** | L1, L2, L3 | **CO1** |
| | **Module 2** | | | |
| **3 a.** | If $y = \log\left(x + \sqrt{1 + x^2}\right)$, prove that $(1 + x^2)y_{n+2} + (2n + 1)xy_{n+1} + n^2y_n = 0.$ | **07** | L1, L2, L3 | **CO2** |
| **b.** | Show that the following pair of curves intersect each other orthogonally: $r^n = a^n \cos n\theta$ and $r^n = b^n \sin n\theta$ . | **07** | L1, L2, L3 | **CO2** |
| **c.** | Find the angle between the radius vector and tangent to the curve:<br>$r^m = a^m(\cos m\theta + \sin m\theta)$ | **06** | L1, L2, L3 | **CO2** |
| | **OR** | | | |
| **4 a.** | If $y = a\cos(\log x) + b\sin(\log x)$ , show that $x^2y_{n+2} + (2n + 1)xy_{n+1} + (n^2 + 1)y_n = 0.$ | **07** | L1, L2, L3 | **CO2** |
| **b.** | Find the angle of intersection between the pair of curves: | **07** | L1, L2, | **CO2** |

| | | | | |
|---|---|---|---|---|
| | $r = a(1 - \cos\theta)$ and $r = 2a\cos\theta$. | | L3 | |
| **c.** | Find the pedal equation of the curve: $\frac{2a}{r} = (1 + \cos\theta)$. | **06** | L1, L2, L3 | **CO2** |
| | **Module 3** | | | |
| **5 a.** | If $u = \log(\tan x + \tan y + \tan z)$, show that $\sin 2x\, u_x + \sin 2y\, u_y + \sin 2z\, u_z = 2$ | **07** | L1, L2, L3 | **CO3** |
| **b.** | If $u = f(2x - 3y, 3y - 4z, 4z - 2x)$ , show that $6\frac{\partial u}{\partial x} + 4\frac{\partial u}{\partial y} + 3\frac{\partial u}{\partial z} = 0$ . | **07** | L1, L2, L3 | **CO3** |
| **c.** | If $u = x^2 + y^2 + z^2, v = xy + yz + zx, w = x + y + z$, find the value of $\frac{\partial(u,v,w)}{\partial(x,y,z)}$ | **06** | L1, L2, L3 | **CO3** |
| | **OR** | | | |
| **6 a.** | If $u = \log(x^3 + y^3 + z^3 - 3xyz)$ , then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = \frac{3}{x+y+z}$ and hence show that $\left(\frac{\partial}{\partial x} + \frac{\partial}{\partial y} + \frac{\partial}{\partial z}\right)^2 u = \frac{-9}{(x+y+z)^2}$. | **07** | L1, L2, L3 | **CO3** |
| **b.** | If $u = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = 0$ . | **07** | L1, L2, L3 | **CO3** |
| **c.** | If $= tan^{-1}\left(\frac{y}{x}\right)$ , show that $\frac{\partial^2 u}{\partial y \partial x} = \frac{\partial^2 u}{\partial x \partial y}$ . | **06** | L1, L2, L3 | **CO3** |
| | **Module 4** | | | |
| **7 a.** | Evaluate $\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z}\, dz\, dy\, dx$ . | **07** | L1, L2, L3 | **CO4** |
| **b.** | Evaluate $\int_{-c}^{c} \int_{-b}^{b} \int_{-a}^{a} (x^2 + y^2 + z^2)\, dz\, dy\, dx$ . | **07** | L1, L2, L3 | **CO4** |
| **c.** | Evaluate $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} cos^8\, x\, dx$ | **06** | L1, L2, L3 | **CO4** |
| | **OR** | | | |
| **8 a.** | Evaluate $\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x + y + z)\ dy\, dx\, dz$ . | **07** | L1, L2, L3 | **CO4** |
| **b.** | Evaluate $\int_0^1 \int_0^{\sqrt{1-y^2}} x^3\, y\, dx\, dy$. | **07** | L1, L2, L3 | **CO4** |
| **c.** | Evaluate $\int_0^{\pi} sin^6\, x\, cos^6\, x\, dx$ . | **06** | L1, L2, L3 | **CO4** |
| | **Module 5** | | | |
| **9 a.** | Solve $\frac{dy}{dx} - y\tan x = \frac{\sin x\, cos^2 x}{y^2}$. by using Bernoulli's differential equation. | **07** | L1, L2, L3 | **CO5** |
| **b.** | Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = \cosh\left(\frac{x}{2}\right)$ | **07** | L1, L2, L3 | **CO5** |
| **c.** | Solve $\frac{d^3y}{dx^3} + 6\frac{d^2y}{dx^2} + 11\frac{dy}{dx} + 6y = 0$ | **06** | L1, L2, L3 | **CO5** |
| | **OR** | | | |
| **10 a.** | Solve $x^3\frac{dy}{dx} - x^2\, y = -y^4 \cos x$ by using Bernoulli's differential equation. | **07** | L1, L2, L3 | **CO5** |

| | | | | |
|---|---|---|---|---|
| **b.** | Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 13y = \cos 2x$ . | **07** | L1, L2, L3 | **CO5** |
| **c.** | If $\frac{dy}{dx} + \frac{y\cos x + \sin y + y}{\sin x + x\cos y + y} = 0$ , verify the differential equation is exact or not. | **06** | L1, L2, L3 | **CO5** |