BCS306A

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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi)

SEMESTER END EXAMINATION QUESTION PAPER

Third Semester B.E. Degree Examination

Regular / Make-up / Arrears / Supplementary

Object Oriented Programming with JAVA

Time: 3 hrs. **Max. Marks:** 100

*Note: Answer **FIVE** full questions, choosing **ONE** full question from each module.*

Q. No	Module – 1	Marks	CO, RBT
1a.	Illustrate Java being the Object-Oriented Programming language using OOP principles	6	CO1, L2
1b.	How do you use the arithmetic operators in Java to perform mathematical calculations	6	CO1, L2
1c.	Write a Java program to sort an integer array.	8	CO4, L3
	OR		
2a	Illustrate the concept of bitwise operators in Java and provide an example of their usage?	6	CO1, L2
2b.	How do you handle multiple cases with the same block of code in a switch statement? Explain with example.	6	CO1, L2
2c.	Write a simple java program to display a welcome message and discuss each line of the code in detail. Write commands for compilation and execution of a Java program with an example for each.	8	CO4, L3
	Module – 2		
3a.	Construct a person class with instance variables name and age and a constructor to initialize, a compare method to compare 2 person objects and return person object with greater age. Write driver class to find eldest person among N person objects	10	CO2, L3
3b.	Demonstrate with an example how 'this' keyword is used in constructors.	5	CO2, L2
3c	Demonstrate the use of Constructor in java. Explain Parameterized Constructor with example	5	CO2, L2
	OR		
4a.	Develop a program to swap 2 objects of a Number class. Number class has an instance variable of type double, a constructor to initialize and the swap method.	10	CO2, L3
4b.	Write a Java program using Class with the following specifications. Class name-Salary, Data members: private int basic, Member functions-void input():to input basic pay, void display(): to calculate and print the following: da=30% of basic, hra=10% of basic, gross=basic+da+hra.	10	CO2, L3
	Module – 3		
5a.	Model the usage of 'super' in Java.	6	CO3, L3

5b.	With example elaborate the use of constructors in inheritance.	7	CO4, L3
5c.	Compare and contrast Method Overloading and Method Overriding with example.	7	CO4, L3
	OR		
6a.	Declare an employee class with instance variables empid, name and salary and methods to input and display employee data. Extend this class in Programmer class. Programmer class has an instance variable bonus and method to input and display Programmer data and main() method to create and test programmer object.	10	CO3, L3
6b.	Demonstrate multilevel inheritance of Animal->Dog->BabyDog. Each class should have a method displaying a message specific to the animal. Create an object of each class and invoke the all the relevant methods	10	CO4, L3
	Module – 4		
7a.	How can you create custom packages in Java to encapsulate related classes and provide a clear namespace for your application?	8	CO3,L2
7b.	Develop a Java program to handle NullPointerException.	6	CO3,L3
7c.	Compare checked and unchecked exceptions. Give suitable example.	6	CO3,L2
	OR		
8a.	Illustrate the creation of custom exception classes in Java with syntax of necessary constructs and an example.	10	CO3,L2
8b.	Develop a Java program to handle a chained exception. The top layer exception is NullPointerException and the cause exception is ArithmeticException.	10	CO3,L3
	Module – 5		
9a.	Identify the major aspects of the Java Thread model.	6	CO3, L3
9b.	Demonstrate the use of isAlive() method in Java with help of a suitable example program.	6	CO3, L2
9c.	Demonstrate synchronization of threads in Java with help of a suitable example program.	8	CO3, L2
	OR		
10a.	Design a Java program to change the name and priority of the main thread. Main thread Displays numbers from 1 to 100 . Show the name, priority and thread pool name before and after the changes.	10	CO3, L3
10b.	Discuss the process of creating threads in Java by implementing Runnable Interface. Give syntax of necessary constructs and a program example.	10	CO3, L3

Course Outcomes (COs):

COs	At the end of the course, the student will be able to
CO-1	Demonstrate the fundamentals of Java programming constructs.
CO-2	Interpret the object oriented features of Java programming language.
CO-3	Apply the object oriented programming constructs to solve complex problems .
CO-4	Develop the solutions using the OOP concepts for simple to complex problems.
CO-5	Design applications using Object Oriented programming for real time applications.

L1- Remembering L2 - Understanding L3 – Applying L4- Analyzing L5 - Evaluating L6 -Creating

"Satisfaction lies in the effort, not in the attainment, full effort is full victory"

BCS302

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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi)

SEMESTER END EXAMINATION QUESTION PAPER

Third Semester B.E. Degree Examination

Regular / Make-up / Arrears / Supplementary

DIGITAL DESIGN AND COMPUTER ORGANIZATION

Time: 3 hrs. **Max. Marks:** 100

*Note: Answer **FIVE** full questions, choosing **ONE** full question from each module.*

Q. No	Module – 1	Marks	CO, RBT
1a.	Simplify the following Boolean expressions to a minimum number of literals using Boolean properties. Also sketch logic diagrams of the circuits that implement the original and simplified expressions. i. (x + y) (x + y') ii. xyz + x'y + xyz' iii. (A + B)'(A' + B')'	 3 4 3	CO1, L3
1b.	i. Solve the following Boolean function F, together with the don't-care conditions d, using no more than two NOR gates using K-Map : Assume that both the normal and complement inputs are available. F(A, B, C, D) = Σ(2, 4, 10, 12, 14), d(A, B, C, D) = Σ(0, 1, 5, 8). ii. Simplify the following Boolean function F, together with the don't-care conditions d using K-Map, and then express the simplified function in sum-of-minterms form: F(A, B, C, D) =Σ (4, 12, 7, 2, 10), d(A, B, C, D) = Σ0, 6, 8)	5 5	CO1, L3
	OR		
2a.	Solve the following function: F (A, B, C, D) = $\sum_m$(1,2,5,7,9,15) +d(0,3,11) using Quine-McClusky method?	10	CO1, L3
2b.	Apply K Map method to simplify the given expression F=A'B'CD'+A'BCD'+ABCD'+AB'CD'+AB'C'D'+AB'C'D+AB'CD and design the Verilog code for the given above expression.	5+5	CO1, L3 CO1, L3
	Module – 2		
3a.	i. Define a Decoder also describe a 3-to-8-line decoder ii. Develop a full adder with a decoder	5 5	CO2, L3 CO2, L3
3b.	Interpret a Boolean function F (A, B, C, D) = ∑ (0,1,3,5,7,10,11,13,14,15) with a 8- to -1multiplexer	10	CO4, L3
	OR		
4a.	Develop a 4-bit Carry look ahead adder. Dose it overcome the disadvantage of ripple carry adder, Justify your answer	10	CO2, L3

4b.	Illustrate the working of SR Flipflop with its characteristic equation and implement using Verilog HDL.	10	CO4, L3
	Module – 3		
5a.	Interpret the expression X=(A-B) *(C+D) with zero address, one address, two address and three address code	10	CO3, L2
5b.	Describe and show the Performance of a computer along with the Processor Clock, Basic Performance Equation, Clock Rate and its performance measurement.	10	CO3, L3
	OR		
6a.	Explain all the Addressing modes with suitable syntax and example?	10	CO3, L2
6b.	Develop an Assembly level program to find the average of N numbers.	10	CO3, L3
	Module – 4		
7a.	Construct a program to reads one line from the keyboard till return key press, store it in memory buffer and echoes it back to the display.	10	CO3, L3
7b.	Illustrate various methods for handling multiple interrupt requests raised by multiple devices	10	CO3, L2
	OR		
8a.	Explain different Bus arbitration techniques.	10	CO3, L2
8b.	Discuss in detail the working of set associative cache with two blocks per set	10	CO3, L3
	Module – 5		
9a.	What is pipelining? Explain the operation of a 4-stage pipeline with a diagram	10	CO3, L2
9b.	Illustrate with a diagram the single bus organisation of computer	10	CO3, L2
	OR		
10a.	Illustrate the sequence of operations required to complete the execution instruction Add (R3),R1	10	CO3, L2
10b.	What are Hazards in a pipeline? Discus the different types of Hazards and its effect on pipeline performance	10	CO3, L2

Course Outcomes (COs):

COs	At the end of the course, the student will be able to
CO-1	Illustrate the various techniques to solve the logic/Boolean expressions.
CO-2	Experiment and simulate to realize the digital circuits.
CO-3	Analyze the functionality of various units in a processor.
CO-4	Demonstrate the various digital circuits using hardware and software tools.
	L1- Remembering L2 - Understanding L3 – Applying L4- Analyzing L5 - Evaluating L6 -Creating

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BCS304

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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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SEMESTER END EXAMINATION QUESTION PAPER

Third Semester B.E. Degree Examination

Regular / Make-up / Arrears / Supplementary

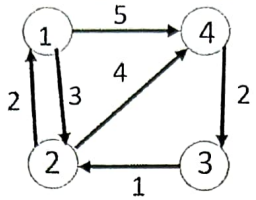
Data structures and Applications

Time: 3 hrs. **Max. Marks:** 100

*Note: Answer **FIVE** full questions, choosing **ONE** full question from each module.*

Q. No	Module – 1	Marks	CO, RBT
1a.	Define data structures. Explain in detail different types of data structures with neat diagram and its operations.	10	CO1, L1
1b.	Illustrate and write a menu driven program in C for the following operations on STACK of Integers (Array Implementation of Stack with maximum size MAX) a. Push an Element on to Stack b. Pop an Element from Stack c. Demonstrate Overflow and Underflow situations on Stack d. Display the status of Stack e. Exit Support the program with appropriate functions for each of the above operations.	10	CO2, L2
	OR		
2a	How dynamic memory allocation functions supported by C programming language with Prototypes and examples.	10	CO1, L1
2b.	Illustrate a program in C to convert an Infix Expression to Postfix Expression. Program should support for both parenthesized and un parenthesized expressions with the operators: +, -, *, /, %(Remainder), ^ (Power) and alphanumeric operands.	10	CO2, L2
	Module – 2		
3a.	Infer a menu driven Program in C for the following operations on Double Ended QUEUE of integers (Array Implementation of Queue with maximum size MAX) a. Perform Deletion at front of QUEUE b. Perform Insertion at rear of QUEUE c. Display the status of QUEUE d. Exit Support the program with appropriate functions for each of the above operations.	10	CO1, L2
3b.	Illustrate a menu driven C Program for the following operations on Circular QUEUE of integers (Array Implementation of Queue with maximum size MAX) a. Insert an Element on to Circular QUEUE	10	CO1, L2

	b. Delete an Element from Circular QUEUE c. Demonstrate Overflow and Underflow situations on Circular QUEUE d. Display the status of Circular QUEUE e. Exit Support the program with appropriate functions for each of the above operations.		
	OR		
4a.	Show a C program to implement QUEUE using dynamic memory allocation.	10	CO1, L2
4b.	Illustrate recursion. Write recursive C programs for the following: A. Tower of Hanoi. B. GCD of two numbers using Euclid's algorithm.	10	CO1, L2
	Module – 3		
5a.	Build a menu driven Program in C for the following operations on Doubly Linked List (DLL) of Employee Data with the fields: SSN, Name, Dept, Designation, Sal, PhNo a. Perform Insertion at Front in the DLL b. Perform Deletion at Front in the DLL. c. Display the status of DLL. d. Exit.	10	CO1, L3
5b.	Construct a 'C' program to implement queues using singly linked lists.	10	CO3, L3
	OR		
6a.	Develop a menu driven Program in C for the following operations on circular linked list(CLL): a. Insertion at the end b. Deletion at the end c. Display the status of DLL d. Exit.	10	CO1, L3
6b.	Select two polynomials A: $3x^{14} + 2x^8 + 1$, B: $8x^{14} - 3x^{10} + 10x^6$, with one variables. Represent this polynomial in the program using appropriate data structure. Write functions to add two polynomials and also to attach a node to the end of a list.	10	CO3, L3
	Module – 4		
7a.	Illustrate is a tree? With suitable example, define: (i) Binary Tree (ii) Level of the binary tree (iii) Complete binary tree (iv) Degree of a node	10	CO2, L2
7b.	Examine a 'C' function to Delete a node from a Binary Search Tree (BST). Give the diagrammatic presentations for the same.	10	CO2, L4
	OR		
8a.	Demonstrate an Expression tree for the expression: A + B * C / D (Infix). Write a C function/s to construct an expression tree for a given expression and display it in postfix form.	10	CO3, L2
8b.	Examine a C function to construct a Binary Search tree. Also write the functions to perform the following traversals on BST: Pre-order, In-Order and Post-order.	10	CO2, L4
	Module – 5		

9a.	Evaluate Floyd's algorithm/Function in C. Apply Floyd's algorithm to find the "All pair shortest path" for the graph given in Fig: Q9a:  Fig Q9a	10	CO3, L5
9b.	Analyze a C Program for the following operations on Graph(G) of Cities a. Create a Graph of N cities using Adjacency Matrix. b. Print all the nodes reachable from a given starting node in a digraph using any traversal method (DFS or BFS).	10	CO3, L4
	OR		
10a.	Choose a Program in C that uses Hash function H: K →L as H (K) = K mod m (remainder method), and implement hashing technique to map a given key K to the address space L. Resolve the collision (if any) using linear probing.	10	CO4, L5
10b.	Evaluate Warshall's algorithm/C Function. Apply Warshall's algorithm to find the transitive closure of the graph defined in the adjacency matrix given in Fig: Q10b. $\begin{bmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{bmatrix}$ Fig: Q10b	10	CO3, L2

Course Outcomes (COs):

COs	At the end of the course, the student will be able to
CO-1	Illustrate different types of linear data structures, its operations and algorithms to solve a given problem.
CO-2	Illustrate different types of non-linear data structures, its operations and algorithms to solve a given problem.
CO-3	Examine any given problem, recommend and implement solutions using suitable data structures.
CO-4	Design and implement applications using suitable data structures.

L1- Remembering L2 - Understanding L3 – Applying L4- Analyzing L5 - Evaluating L6 -Creating

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25 MAR 2024

BCS301

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SEMESTER END EXAMINATION QUESTION PAPER

Third Semester B.E. Degree Examination

Regular / Make-up / Arrears / Supplementary

MATHEMATICS FOR COMPUTER SCIENCE

Time: 3 hrs. **Max. Marks:** 100

*Note: Answer **FIVE** full questions, choosing **ONE** full question from each module.*

Q. No	Module – 1	Marks	CO, RBT
1a.	The probability distribution of a finite random variable X is given by the following table x: -3, -2, -1, 0, 1, 2, 3 $P(x)$: k, 2k, 3k, 4k, 3k, 2k, k For what value of k, this represents a valid probability distribution? Also find $p(x \leq 1)$, $p(x > 1)$, $p(-1 < x \leq 2)$, mean and standard deviation.	7	CO1, L3
1b.	The probability that a pen manufactured by a factory be defective is 1/10. If 12 such pens are manufactured, what is the probability that i) exactly 2 are defective ii) at least 2 are defective iii) none of them are defective	7	CO1, L3
1c.	In a certain town the duration of a shower is exponentially distributed with mean 5 minutes. What is the probability that a shower will last for (i) 10 minutes or more (ii) less than 10 minutes (iii) between 10 and 12 minutes	6	CO1, L3
	OR		
2a	Find the constant k such that $f(x) = \begin{cases} kx^2, 0 < x < 3 \\ 0, otherwise \end{cases}$ is a p.d.f. Also find $P(x > 1)$, $P(x \leq 1)$ and $P(1 < x < 2)$.	6	CO1, L3
2b.	Find mean, variance and standard deviation of Poisson distribution.	7	CO1, L2
2c.	In a normal distribution 31% of the items are under 45 and 8% of the items are over 64. Find the mean and S.D of the distribution, given A(1.4) = 0.4192 and A(0.5) = 0.1915.	7	CO1, L3

	Module – 2		
3a.	A joint probability distribution is given by the following table: Y / X | 3 | 4 | 5 2 | 1/6 | 1/6 | 1/6 5 | 1/12 | 1/12 | 1/12 7 | 1/12 | 1/12 | 1/12 Find $E(X), E(Y), E(XY), Cov(X,Y)$ and $\rho(X, Y)$.	10	CO1, L3
3b.	Show that $P = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1/2 & 1/2 & 0 \end{bmatrix}$ is a regular stochastic matrix and find the corresponding unique fixed probability vector.	10	CO3, L3
	OR		
4a.	The joint probability function of two discrete random variables x and y is $f(x,y) = c(2x + y)$, where x and y can assume all integral values such that $2 < x < 6, 0 < y < 5$ and $f(x,y) = 0$ otherwise. Find (i) the value of c (ii) $P(3 < x < 4, y > 2)$ (iii) $P(x \geq 4, y \geq 1)$ (iv) $P(x > 2, y < 2)$.	10	CO1, L3
4b.	Every year, a man trades his car for a new car. If he has Maruti , he trades it for an Ambassador. If he has an ambassador, he trades it for Santro. However, if he has Santro he is just likely to trade it for anew Santro as to trade it for a Maruti or an Ambassador. In 2000, he bought his first car which was Santro. Find the probability that he has a)2002 Santro b) 2002 Maruti.	10	CO3, L3
	Module – 3		
5a.	A population consists of five numbers 2, 3, 6, 8, 11. Consider all possible samples of size 2 which can be drawn with replacement from this population. Find a) the mean and S.D of the population. b) the mean and S.D of the sampling distribution of means. c) considering samples without replacement find the mean and S.D of the sampling distribution of means.	8	CO2, L3
5b.	Explain the following terms: (i) Null Hypothesis (ii) Confidence limits (iii) Type I and Type II Errors (iv) Level of significance (v) Standard error	6	CO2, L2
5c.	A coin is tossed 1000 times and head turns up 40 times. Decide on the hypothesis that the coin is unbiased.	6	CO2, L3
	OR		
6a.	Certain tubes manufactured by a company have mean life time of 800 hours and S.D of 6 hour. Find the probability that a random sample of 16 tubes taken from the group will have a mean life time (a) between 790 hours and 810 hours (b) less than 785 hours (c) more than 820 hours (d) between 770 hours and 830 hours. Given $A(0.67) = 0.2486, A(1) = 0.3413, A(1.33) =$	8	CO2, L3

<table>
<tr><td></td><td>$0.4082\ and\ A(2) = 0.4772.$</td><td></td><td></td></tr>
<tr><td>6b.</td><td>A die is thrown 9000 times and a throw of 3 or 4 was observed 3240 times. Show that the die cannot be regarded as an unbiased one.</td><td>6</td><td>CO2, L3</td></tr>
<tr><td>6c.</td><td>A random sample for 1000 workers in company has mean wage of Rs. 50 per day and S.D. of Rs. 15. Another sample of 1500 workers from another company has mean wage of Rs. 45 per day and S.D of Rs. 2. Does the mean rate of wages varies between the two companies? Find the 95% confidence limits for the difference of the mean wages of the population of the two companies.</td><td>6</td><td>CO2, L3</td></tr>
<tr><td colspan="4">Module – 4</td></tr>
<tr><td>7a.</td><td>A certain stimulus administered to each of 12 patients resulted in the following change in blood pressure: 5, 2, 8, -1, 3, 0, 6, -2, 1, 5, 0, 4 (in appropriate units). Can it be concluded that, on the whole, the stimulus will change the blood pressure. Use $t_{0.05}(11) = 2.201$.</td><td>7</td><td>CO2, L3</td></tr>
<tr><td>7b.</td><td>Fit a Poisson distribution to the following data and test for its goodness of fit at 5 % level of significance.
<table>
<tr><td>x</td><td>0</td><td>1</td><td>2</td><td>3</td><td>4</td></tr>
<tr><td>f</td><td>122</td><td>60</td><td>15</td><td>2</td><td>1</td></tr>
</table>
(Given $\chi^2_{0.05}$ for $\gamma = 3$ is 7.815).</td><td>7</td><td>CO2, L3</td></tr>
<tr><td>7c.</td><td>A sample of 12 measurements of the diameter of metal ball gave the mean 7.38 mm with standard deviation 1.24mm. Find (i) 95% and (ii) 99% confidence limits for actual diameter given $t_{0.05}(11) = 2.201$ and $t_{0.01}(11) = 3.11$.</td><td>6</td><td>CO2, L3</td></tr>
<tr><td colspan="4">OR</td></tr>
<tr><td>8a.</td><td>Two horses A and B were tested according to time to run a particular race with the following results:
<table>
<tr><td>Horse A</td><td>28</td><td>30</td><td>32</td><td>33</td><td>33</td><td>29</td><td>34</td></tr>
<tr><td>Horse B</td><td>29</td><td>30</td><td>30</td><td>24</td><td>27</td><td>29</td><td></td></tr>
</table>
Test whether you can discriminate between the two horses. ($t_{0.05}$ = 2.2 for 11 d.f).</td><td>7</td><td>CO2, L3</td></tr>
<tr><td>8b.</td><td>Five dice were thrown 96 times and the numbers 1, 2 or 3 appearing on the face of the dice follows the frequency distribution as below:
<table>
<tr><td>No. of dice showing 1,2 or 3</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</td></tr>
<tr><td>Frequency</td><td>7</td><td>19</td><td>35</td><td>24</td><td>8</td><td>3</td></tr>
</table>
Test the hypothesis that the data follows a binomial distribution. (Given $\chi^2_{0.05}$ for $\gamma = 5$ is 11.07).</td><td>7</td><td>CO2, L3</td></tr>
<tr><td>8c.</td><td>A group of 10 boys fed on a diet A and another group of 8 boys fed on a different diet B for a period of 6 months recorded the following increase in weights lbs.
<table>
<tr><td>Diet A</td><td>5</td><td>6</td><td>8</td><td>1</td><td>12</td><td>4</td><td>4</td><td>3</td><td>9</td><td>6</td><td>10</td></tr>
<tr><td>Diet B</td><td>2</td><td>3</td><td>6</td><td>8</td><td>10</td><td>1</td><td>2</td><td>8</td><td></td><td></td><td></td></tr>
</table></td><td>6</td><td>CO2, L3</td></tr>
</table>

	Test whether diets A and B differ significantly regarding their effect on increase in eight. ($t_{0.05} = 2.12$ for 16 d.f)		
	Module – 5		
9a.	Fit a parabola of the form $y = a + bx + cx^2$ for the following data by the method of least squares and hence estimate y at $x = 6$ x: 1, 2, 3, 4, 5 y: 10, 12, 13, 16, 19	7	CO4, L3
9b.	Find the correlation coefficient for the following data x: 92, 89, 87, 86, 83, 77, 70, 63, 53, 50 y: 86, 83, 91, 77, 68, 85, 54, 82, 37, 57	7	CO4, L3
9c.	Ten competitors in a beauty contest are ranked by two judges in the following order. Compute the coefficient of rank correlation. x: 1, 6, 5, 3, 10, 2, 4, 9, 7, 8 y: 6, 4, 9, 8, 1, 2, 3, 10, 5, 7	6	CO4, L3
	OR		
10a.	Fit a curve of the form $y = ax^b$ to the following data and estimate y at x = 12 x: 20, 16, 10, 11, 14 y: 22, 41, 120, 89, 56	7	CO4, L3
10b.	Find the correlation coefficient for the following data x: 36, 23, 27, 28, 28, 29, 30, 31, 33, 35 y: 29, 18, 20, 22, 27, 21, 29, 27, 29, 28	7	CO4, L3
10c.	Compute the rank correlation coefficient for the following data x: 68, 64, 75, 50, 64, 80, 75, 40, 55, 64 y: 62, 58, 68, 45, 81, 60, 68, 48, 50, 70	6	CO4, L3

Course Outcomes (COs):

COs	At the end of the course, the student will be able to
CO-1	Analize various probability distributions occurring in in the modeling of various physical and engineering phenomena.
CO-2	Use statistical methodology and tools in the engineering problem-solving process.
CO-3	Apply the notion of a discrete-time Markov chain and n-step transition probabilities to solve the given problem.
CO-4	Make use of the concepts of method of least squares, correlation and regression analysis to fit a suitable mathematical model for the statistical data.

L1- Remembering L2 - Understanding L3 – Applying L4- Analyzing L5 - Evaluating L6 -Creating

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30 MAR 2024

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BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(An Autonomous Institute affiliated to Visvesvaraya Technological University, Belagavi)

SEMESTER END EXAMINATION QUESTION PAPER

Third Semester B.E. Degree Examination

Regular / Make-up / Arrears / Supplementary

OPERATING SYSTEM

Time: 3 hrs. **Max. Marks:** 100

*Note: Answer **FIVE** full questions, choosing **ONE** full question from each module.*

Q. No	Module – 1	Marks	CO, RBT
1a.	Define Operating system. Explain the dual mode operation of operating system.	6	CO1,L2
1b.	Explain layered approach structure of operating system with a neat diagram.	7	CO1, L2
1c.	Explain system calls with an example of handling a user application invoking the open() system call.	7	CO1, L2
	OR		
2a	Discuss briefly about multiprocessor and clustered systems.	10	CO1, L2
2b.	Illustrate the services of operating system with a neat diagram	10	CO1, L2
	Module – 2		
3a.	Explain Message passing and shared memory concept of IPC. Develop a C Program to implement IPC.	10	CO4, L3
3b.	Distinguish between preemptive and nonpreemptive scheduling.Model the Gantt Chart and calculate average waiting time and average turnaround time for the following snapshot of the processes using i) Priority (non preemptive) ii) Priority (preemptive) scheduling algorithms. Note: Higher number represents higher priority	10	CO3, L4
	OR		
4a.	What are the benefits of multithreaded programming? Discuss different multithreading models. Develop a C program to implement Multithreading.	10	CO4, L3
4b.	Model the Gantt Chart and calculate average waiting time and average turnaround time for the following snapshot of the processes using i) SJFS (non preemptive) ii)Round Robin (time stamp=4ms) scheduling algorithms. Which algorithm results in the minimum average waiting time?	10	CO3, L4

Process id	Arrival time	Burst time	Priority
P1	0	4	2
P2	1	3	3
P3	2	1	4
P4	3	5	5
P5	4	2	5

		Process id	Arrival time	Burst time		
		P0	0	10		
		P1	1	6		
		P2	3	2		
		P3	5	4		
	Module – 3					
5a.	Explain critical section problem. Analyse the requirements in which the critical section problem must satisfy. Explain Peterson's solution.				10	CO3, L4
5b.	Consider the following snapshot of a system in which five resources A, B, C, D and E are available. The system contains a total of 4 instances of A, 2 of resource B, 2 of resource C, 4 of resource D and 1 of resource E.				10	CO2, L3

	Allocation					*Request*					*Available*				
	A	*B*	*C*	*D*	*E*	*A*	*B*	*C*	*D*	*E*	*A*	*B*	*C*	*D*	*E*
P_0	1	0	1	1	0	0	1	0	0	1	2	1	1	2	1
P_1	1	1	0	0	0	0	0	1	0	1					
P_2	0	0	0	1	0	0	0	0	0	1					
P_3	0	0	0	0	0	1	0	1	0	1					

Convert this matrix representation to a resource allocation graph.
Use the appropriate algorithm to determine whether the system contains a deadlock. Which processes are involved in the deadlock?

	OR			
6a.	Discuss briefly about semaphores in synchronization. Analyse how semaphores are used to solve producer consumer problem.		10	CO3, L4
6b.	Use appropriate algorithm to determine whether the following system is in a safe state:		10	CO2, L3

Processes	Allocation	Max	Available
	A B C	A B C	A B C
P0	1 1 2	4 3 3	2 1 0
P1	2 1 2	3 2 2	
P2	4 0 1	9 0 2	
P3	0 2 0	7 5 3	
P4	1 1 2	1 1 2	

	Module – 4		
7a.	What is paging? Identify the common techniques for structuring the page table.	10	CO2, L3
7b.	Consider the following page reference string: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults occur for the following page replacement algorithms assuming 5 frames: i) LRU replacement ii) FIFO replacement iii) Optimal replacement. Write a C program to implement FIFO page replacement	10	CO4, L3
	OR		
8a.	Illustrate how demand paging affects systems performance. Describe the steps in handling a page fault with a neat sketch.	10	CO2, L2
8b.	Describe different strategies used to select a free hole from the set of available holes in memory allocation. Distinguish between internal and external fragmentation. Develop a C program to implement Best Fit allocation method	10	CO4, L3
	Module – 5		

9a.	Explain various Disk scheduling algorithms in detail with examples.	10	CO1, L2
9b.	With neat diagrams, explain any two disk allocation methods in detail.	10	CO1, L2
	OR		
10a.	Discuss the most common schemes for defining the logical structure of a directory with neat diagrams.	10	CO1, L2
10b.	Explain Access matrix method of system protection with domain as objects and its implementation.	10	CO1, L2

Course Outcomes (COs):

COs	At the end of the course, the student will be able to
CO-1	Discuss the Fundamental architectural components concepts of the Operating System.
CO-2	Use the appropriate structure and functionality of the operating system.
CO-3	Analyse the various techniques for handling the services of an operating system.
CO-4	Test the various functions, API's and Algorithms of Operating System using 'C' Language.
	L1- Remembering L2 - Understanding L3 – Applying L4- Analyzing L5 - Evaluating L6 -Creating

"Satisfaction lies in the effort, not in the attainment, full effort is full victory"