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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCSEG **Max Marks: 100**
Course: Software Engineering

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Discuss the responsibilities that the software engineers should have towards professional and society. State ACM/IEEE principles that software engineers should adhere to the code of Ethics and professional practice. **6**

b) Give reasons for your answers based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems: **6**

i) An interactive system that allows flight passengers to find flight times from terminals installed in airports.
ii) A banking accounting system that replaces an existing system.
iii) A system to control anti-lock braking in a bike.

c) A software system is to be developed to manage the records of the candidates who register for the Online Course. The record includes the records of all candidates (Course name, duration, start and end dates assignment submission and so on) After the completion of the course the candidate has to take up an exam and qualify the exam with certain minimum percentage for certification. Classify and explain the Non-functional requirements hierarchy diagram for the above software system. **8**

OR

2 a) Explain the metrics for specifying non-functional requirements. **6**

b) Draw the sequence diagram showing the action performed in ATM withdrawal system. You can make any reasonable assumptions about the system. Pay particular attention for specifying user errors. **6**

c) Illustrate the problems of using natural language for defining user and system requirements, using the example for Insulin Pump Control Software. Explain how structuring natural into forms can help avoid some of these difficulties. **8**

UNIT - II

3 a) Identify and analyze the principal viewpoints for the vacation package

reservation service. Organize these using a viewpoint hierarchy diagram with appropriate explanation. **6**

b) Consider the "Online Fresh Food Store" application where users can place order for the item required using this app. Design the context diagram for this application by showing the various entities that interact with it. Explain your diagram clearly. **6**

c) Design the state machine model for an automatic washing machine that has different programs for different types of clothes. Give the state and stimulus description for the automatic washing machine. **8**

UNIT - III

4 a) Explain the Object Oriented Decomposition for an invoice processing system with a neat diagram. Discuss their advantages and disadvantages. **6**

b) Using the UML graphical notations identify the object classes, attributes and operations. Also add generalization and aggregation for the following: University Admission Management System. **6**

c) Analyze the system and suggest an appropriate structural model for the following. Give reasons for your answers. **8**

i) An automated ticket-issuing system used by passengers at the railway station.

ii) A computer-controlled video conferencing system that allows video, audio and computer data to be visible to several participants at the same time.

Analyze the system and suggest an appropriate control model for the following. Give reasons for your answers

i) A television controller that responds to signals from a remote control unit

ii) A batch processing system that takes information about hours worked and pay rates and also prints salary slips, bank credit transfer information.

UNIT - IV

5 a) As a project manager of a company, what are the basic principles you must adopt when you develop a complete schedule for the project? **6**

b) NETSIM is a network simulation software with an estimated Line of Code (LOC) of 33200. If a team produces an average productivity of 620 LOC per month at the burdened labour rate of $8000 per month calculate **6**

i) Cost per line of code
ii) Total cost of the software
iii) Estimation in person-months

c) What types of risks are likely to encounter as the software is being built and as the technical leader how do you assess the overall risk associated with the software? **8**

UNIT - V

6	a)	Explain the principles of agile methods.	**6**
	b)	Consider that an organization has 20 legacy systems. Analyze how the quality and the business value of each of these systems is assessed and compared with others by plotting it on a chart showing relative business value and system quality. Discuss the different clusters that could be formed. Explain in detail.	**6**
	c)	Differentiate between Whitebox and Blackbox testing.	**8**

OR

7	a)	Explain Clean Room Software development with a neat diagram.	**6**
	b)	Discuss why program inspections are an effective technique for discovering errors in a program. What types of checks are used to discover errors through inspections?	**6**
	c)	Analyze the following Scenario. Payment Collection Process: Payment may be made in 3 different ways. The user selects which way they wish to pay. If the user has a library subscription, then they can input the subscriber key which should be checked by the system. Alternatively, they can input an organizational account number. If this is valid, a debit of the cost of the article is posted to this account. Finally, they may input the 16-digit credit card number and expiry date. This should be checked for validity and if valid a debit is posted to that credit card account. Write the Test case description for credit card validity with the following details: Input, Tests, Output	**8**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCUSP **Max Marks: 100**
Course: Unix Shell and System Programming

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1 a) With a neat diagram, explain the kernel and shell relationship in UNIX operating System. **5**

b) Consider two files with names flower1 and flower2 in FIRST directory. **5**

Flower1	Flower2
Rose	Rose
Daisy	Jasmine
Marigold	Hibiscus
Lily	Lily
Daffodil	Daisy

Write the output of the following command
cmp flower1 flower2
comm flower1 flower2
cat flower1 flower2 | wc -l
diff flower1 flower2
cp -R FIRST CLIST

c) i) Identify the syntax error in the script given below. Correct them and find the functionality of the program **10**

```
#!/bin/sh
if [ $# -eq 0 ] then
echo "Error - Number missing form command line argument"
echo "Syntax : $0 number"
echo " Use to print multiplication table for given number"
 exit 1
fi
n=$1 i=1
while[ $i -le 10]
do
temp=“expr $i \* $n”
echo “$n * $i=temp”
i=`expr $i + 1`
done
```

ii) Describe about gzip,gunzip,zip and unzip commands with examples to each.

UNIT - II

2 a) i) Write a shell script to check whether two arguments passed to scripts are same or not **10**

ii) Write a menu- driven shell script program for implementing a Calculator

b) i) Write a shell script to print a number in reverse order **10**

ii) Write a shell script to check whether given number is prime or not.

OR

3 a) i) Describe the working of set and shift commands in unix, with examples. **10**

ii) Write a shell script to check palindrome of number

b) i) Describe here document (<<) in unix with examples. **10**

ii) Write a shell script to find factorial of a number.

UNIT - III

4 a) i) Explain relative and Absolute permissions of a file with an example to user, group and others. **10**

ii) Differentiate hard links and symbolic links. Illustrate the creation of one link of each type and discuss.

b) i) Assume stud.lst is a file with details of students in 10 lines. Analyze the functionalities of the commands given below. **10**

a. touch -m 011522020 stud.lst

b. tr -t -d -n stud.lst

c. head -n 6 stud.lst | tee shortlist

d. cut -d "|" -f 1,4- stud.lst > shortlist.lst

e. sort -t "|" -r -k 2 stud.lst

ii.) Describe about umask and touch commands of unix.

UNIT - IV

5 a) Write a C/C++ program to implement copy command of unix using API's. **10**

b) i) Explain how Unix Kernel supports API's, with a neat diagram **10**

ii) Write a C/C++ POSIX compliant program that prints the POSIX defined Configuration options supported on any given system using feature test macros.

UNIT - V

6 a) Describe how processes can be terminated in unix environment, with necessary diagrams. **10**

b) Write a C/C++ program that demonstrates setjmp and longjmp by creating three user-defined functions say f1, f2, and f3. The function calls are as main() calls f1 which inturn calls f2 which calls f3. Let the user decide if f2 returns back to main or calls f3 which returns back to main. The main function displays which function was called last (f2 or f3) **10**

OR

7 a) i) Describe with neat diagram Environment variables. **10**
ii) Describe the different segments of the Memory layout for processes with diagram

b) Explain the different exec function, and write a C program to perform a word count and printing number of lines using execv function. **10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PEADS **Max Marks: 100**
Course: Advanced Data Structures

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Demonstrate the usage of unrolled linked list with an example. **6**

b) Justify how XOR linked list is better with respect to memory with an example. **6**

c) Describe how disjoint set can be represented. Analyze the given code to check whether a graph contains a cycle or not using disjoint sets and appropriately complete the code. **8**

```
int find(int parent[], int i)
{
    -----
}
void Union(int parent[], int x, int y)
{
    -----
}
int isCycle( struct Graph* graph )
{
  int *parent = (int*) malloc( graph->V * sizeof(int) );
  memset(parent, -1, sizeof(int) * graph->V);
  for(int I = 0; I < graph->E; ++i)
  {
    int x = find(parent, graph->edge[i].src);
    int y = find(parent, graph->edge[i].dest);
    if (x == y)
    return 1;
    Union(parent, x, y);
  }
  return 0;
 }
```

OR

2 a) Explain the concept of Smart Union and Path Compression with an example. **6**

b) Differentiate among the following self-organizing list with an example and **6**

justify which method is optimal.

- Count Method
- Transpose Method

c) Demonstrate and show the contents of the Skip list after inserting the following sequence of elements: **8**

- 12 with level 2
- 17 with level 4
- 20 with level 1
- 25 with level 4
- 31 with level 3
- 38 with level 2
- 39 with level 1
- 50 with level 1
- 55 with level 4

After the skip list is constructed, perform the following deletes and update the list. Show steps clearly.

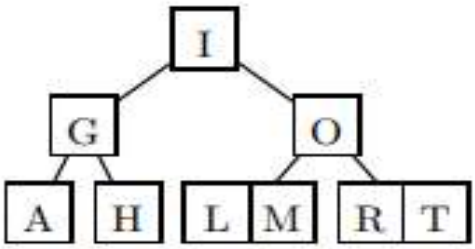
- Delete 17
- Delete 38

UNIT - II

3 a) Construct an AVL tree for the following sequence of elements: **8**
63, 9, 19, 27, 18, 108, 99, 81

b) Analyze the below 2-3 tree and show the updated tree contents after the following operations: **6**

- Insert 'S'
- Delete 'A'

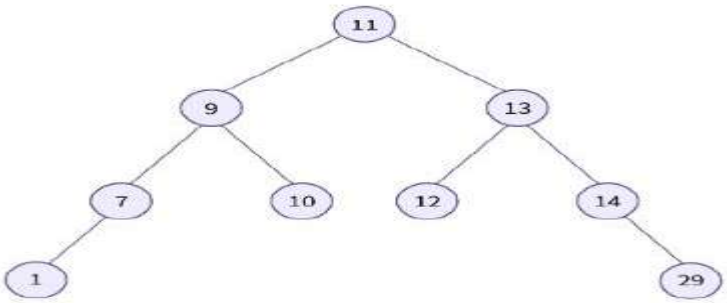


c) Differentiate between Splay tree and AVL tree. **6**

OR

4 a) Construct a B-tree of order 5 for the following sequence of characters. After creating the tree, perform Delete 'E' and Delete 'F'. Show the steps clearly. **8**
A, F, B, K, D, H, M, J, E, S, I, R, X, C, L, N, T, U, P

b) Analyze the below Splay tree and identify what type of rotation needs to be taken to splay at element 9. Also, show the updated tree contents after splay at 9. **6**



c) Compare AVL tree and Red Black tree. **6**

UNIT - III

5 a) Create a Trie data structure for the following strings: **8**

"abc", "abgl", "cdf", "abcd", "lmn"

Also, demonstrate how it searches for the strings: "lmn", "ghi"

b) Demonstrate the usage of Fenwick tree with an example **6**

c) Scapegoat tree is a self-balancing binary tree? Justify your answer with an example **6**

UNIT - IV

6 a) Construct a Hash table for the following sequence of elements: **10**
54,26,93,17,77,31,44,55,20

Show how collision is resolved using the following techniques:

- Linear Probing
- Quadratic Probing
- Double Hashing

Consider hash table size m=11 and Hash functions:

H(K)=K%Table size and $H^1(K)=9 – (K\%9)$

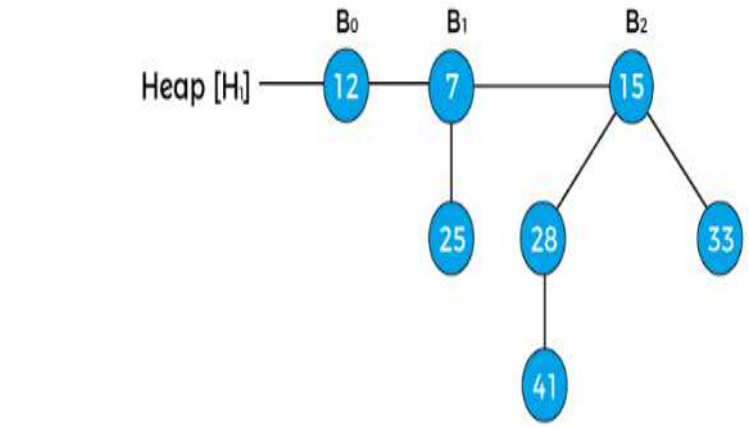
b) Construct a Hash table for the following numbers: **10**

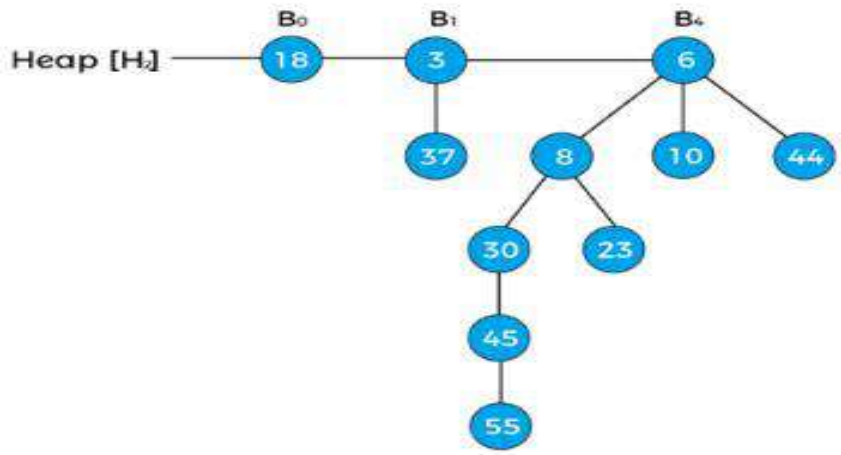
28,4,19,1,22,16,12,0,5,7

Show how collision is resolved using Extendible Hashing with each step demonstrated clearly. Also, mention how directory expansion and bucket splitting taken place. Consider Bucket limit = 3

UNIT - V

7 a) Apply union operation on the following two Binomial heaps and show the resultant Binomial heap. Demonstrate each step clearly **10**

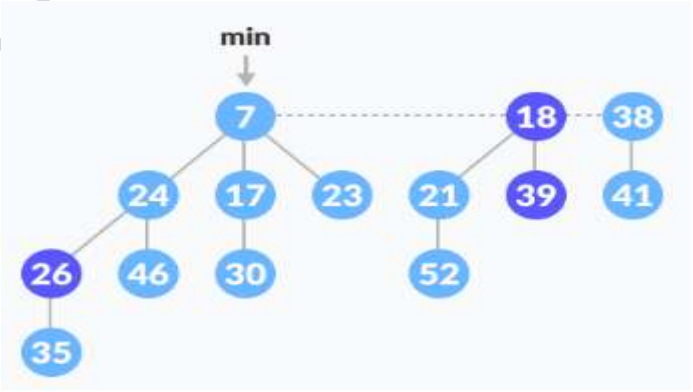




b) For the below Fibonacci Heap, perform the following operations **10**

- Decrease the value 46 to 45
- Decrease the value 45 to 15
- Decrease the value 35 to 5
- Delete the value 7

Show all the steps clearly. Note: Marked nodes are 26,18,39



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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science & Engineering **Duration: 3 hrs.**
Course Code: 22CS5BSBCS **Max Marks: 50**
Course: Biology for CS Engineers

Instructions:
1. Answer **ALL** questions in **PART A** and any **THREE** full questions from **PART B**
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		PART A	CO	PO	Marks
1		The cell Size broadly ranges from: (a) 0.4 µm to 2 mm (b) 0.6 µm to 6 mm (c) 0.2 µm to 2 mm (d) 0.2 µm to 6 mm	CO1	PO1	**1**
2		A molecule is a group of two or more atoms held together by (a) Ionic bond (b) Compounds (c) Chemical bond (d) Covalent bond	CO1	PO1	**1**
3		In Prokaryotic Cell, a true nucleus is present: (a) True (b) False	CO1	PO1	**1**
4		An example for Binucleate Cell is: (a) Opalina (b) Paramecium (c) Red Blood Cells (d) Dendritic Cells	CO1	PO1	**1**
5		Following is the type of a Chromosome based on the position of the centromere: (a) Telocentric (b) Metacentric (c) Acrocentric (d) All of the above	CO1	PO1	**1**
6		Different genes from the same Traits are called as: (a) Alleles (b) Chromosomes (c) DNA segment (d) None of the above	CO1	PO1	**1**

	7		A process that models information exchange among several individuals is known as: (a) Initialization (b) Selection (c) Recombination (d) None of the above	*CO1*	*PO1*	**1**
	8		The fields of Application of Evolutionary Algorithms are: (a) Combinatorial Optimization (b) Multiple Knapsack Problem (c) Number Partitioning Problem (d) All of the above	*CO1*	*PO1*	**1**
	9		Which of the following is not a mutation operator in a genetic algorithm? (a) Random resetting (b) Scramble (c) Inversion (d) Difference	*CO1*	*PO1*	**1**
	10		Which of the following statements is/are true? A. Encoding, Fitness function, Selection, CrossOver, Mutation are Genetic Algorithms features. B. Crossover operator defines how chromosomes of parents are mixed in order to obtain genetic codes of their offspring. (a) Statement A is true, Statement B is true (b) Statement A is true, Statement B is false (c) Statement A is false, Statement B is true (d) Statement A is false, Statement B is false	*CO1*	*PO1*	**1**
	11		The nucleic acid remaining in the solution can be precipitated by the addition of sodium or ammonium acetate and ethanol. (a) True (b) False	*CO1*	*PO1*	**1**
	12		Fitness function should be (a) maximum (b) minimum (c) intermediate (d) none of these	*CO1*	*PO1*	**1**
	13		Genetic algorithms are example of (a) heuristic (b) Evolutionary algorithm (c) ACO(d) PSO	*CO1*	*PO1*	
	14		Which of the following statement is true in terms of partial digestion? (a) Partial digestion can be defined as a condition which does not recognize any of the site present in the DNA sequence. (b) Partial digestion created a similar number of fragments to that of complete digestion. (c) Partial digestion does not help represent a genomic library (d) It can identify exactly half of the sites in the DNA	*CO1*	*PO1*	**1**

	15		Which of the following activity can't be seen in the case of DNA polymerase? (a) 3'-5' exonuclease (b) 5'-3' exonuclease (c) 5'-3' DNA synthesis (d) 3'-5' DNA synthesis	*CO1*	*PO1*	**1**
	16		_____ enzyme helps in carrying out elements of mobile genetics from one portion of DNA to another. (a) Transposase (b) Endonuclease (c) Ligase (d) Transciptase	*CO1*	*PO1*	**1**
	17		Pheromone quantity in ACO is ___ proportional to path selection. (a) directly (b) inversely (c) not (d) none of the above	*CO1*	*PO1*	**1**
	18		The algorithm in which the individuals evaluate themselves, compare to their neighbors and imitate only those neighbors who are superior to themselves: (a) Particle Swarm (b) Ant Colony (c) Immune Computing (d) Artificial Neural Networks	*CO1*	*PO1*	**1**
	19		Arrange the following steps in genetic algorithm in order: 1. random selection of initial population 2. crossover and mutation 3. encoding of chromosome 4. selection of best parental chromosome (a) 4, 1,2, 3 (b) 3, 1, 4,2 (c) 3, 1, 2, 4 (d) 1, 3, 2, 4	*CO1*	*PO1*	**1**
	20		Swarm intelligence is a type of: (a) Computing with Natural Materials (b) Simulation and Emulation of Nature in Computers (c) Computing Inspired by Nature (d) Calculus Based Method	*CO1*	*PO1*	**1**
			PART B			
	1	a)	Describe the different types of chromosomes. Write the functions of a nucleus.	*CO1*	*PO1*	**5**

		b)	Write the Mendel's Laws of Genetics with Mendelian Crosses as an example.	*CO1*	*PO1*	**5**
	2	a)	With a neat diagram, discuss the molecular structure of a DNA.	*CO1*	*PO1*	**5**
		b)	Why Evolutionary computation is important? Explain the working of Evolutionary Computation.	*CO1*	*PO1*	**5**
	3	a)	Explain the process of Recombination and Mutation in dissecting an evolutionary algorithm.	*CO1*	*PO1*	**5**
		b)	Describe the transcription and translation process in Gene Expression.	*CO1*	*PO1*	**5**
	4	a)	Explain Ant Colony Optimization algorithm with an example.	*CO1*	*PO1*	**5**
		b)	What is RNA Splicing? Explain the process of Spliseosome.	*CO1*	*PO1*	**5**
	5	a)	Explain the working of Particle Swarm Optimization.	*CO1*	*PO1*	**5**
		b)	Discuss the various types of NanoMolecules in Biomedical Sciences.	*CO1*	*PO1*	**5**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5HSSPM **Max Marks: 100**
Course: Software Project Management and Finance

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Define Project. Explain the characteristics of Project. **6**

b) Campbell Industries has a project with the following projected cash flows: **8**
Initial Cost, Year 0: $468,000
Cash flow year one: $135,000
Cash flow year two: $240,000
Cash flow year three: $185,000
Cash flow year four: $135,000
Should this project be accepted or rejected for the following discount rates?:
i) 8%
ii) 14%
iii) 20%
Use NPV model for all the above discount rates.

c) The management of Fine Electronics Company is planning to purchase an equipment to be attached with the main manufacturing machine. The equipment will cost $6,000 and will increase annual cash inflow by $2,200. The useful life of the equipment is 6 years. The management wants a 20% return on all investments. **6**
i) Compute net present value (NPV) of this investment project.
ii) Should the equipment be purchased according to NPV analysis?

OR

2 a) List and explain the skills the Project Manager needs to have to maintain a good environment in a Project and also list the roles of a Project Manager. **6**

b) What are the Payback Periods of Projects E and F? Assume all cash flows are evenly spread throughout the year. If the cut-off period is three years, which projects do you accept? **8**

Projects	E	F
Cost	$40,000	$250,000
Cash Flow Year One	$10,000	$40,000
Cash Flow Year Two	$10,000	$120,000
Cash Flow Year Three	$10,000	$200,000
Cash Flow Year Four	$10,000	$200,000
Cash Flow year Five	$10,000	$200,000
Cash Flow Year Six	$10,000	$200,000

c) A company wants to establish its branch in Jammu and Kashmir. Analyze how the environment affects the company and discuss on the same. **6**

UNIT - II

3 a) List and explain the components of Project Management Plan. **6**

b) Write the Risk plan Script for "Online Food ordering System". **7**

c) Write the Scope and Vision Statement for Library Management System. **7**

UNIT - III

4 a) Define Statement of work. List and explain the contents of SOW. **6**

b) Design a Charter for developing a website for Online course registration System. **8**

c) Discuss how the quality of the Project is related to triple Constraints. Construct the Priority Matrix for the scheduled maintenance of a banking website and analyze how the triple constraints are affected with respect to the given system. Justify your answer. **6**

UNIT - IV

5 a) List and explain the necessary features for cost estimation formula with the steps of Cost Estimation process, and explain the types of cost estimates. **6**

b) A product based company has estimated what they need the following staff: 4 investors where each of them will make 7,00,000 INR per year and 5 technical staffs where each of them will make 3,00,000 INR per year. All the Employees will get company benefits with 1 week of vacation, 10 Holidays and 10 sick leaves, pension plan that costs the company 5% of the labour cost and medical plan that costs 30% of the labour cost. **10**

The investors estimate that they need to borrow a loan of rupees 30,00,000 INR with 8% interest and they plan to pay off the loan in 6 years. They require 15,000 square feet of space, rented at 1000 INR per square foot per year. Software and Hardware equipments are estimated at 50% of the space rental. Payroll, legal and other corporate expenses are estimated at 5% per year. One of the partners performed a study and believes their product will be competitive at 30,000 INR per product and they will be able to sell 1,000 products.

The product costed 10,00,00,000 INR each. The partners plan for a profit percentage of 50%. Calculate the Total Direct labour, Fringe benefits, Total Overhead cost, Gross Profit, Net profit. Is this a profitable venture as per their survey?

c) Differentiate between Delphi Technique vs. Analogous Estimation Technique. **4**

OR

6 a) Define Parametric Estimate. Explain the classification of data Elements. **6**

b) i) You are implementing a website for online shopping. After analyzing the scope, you decide that you need 2 login forms for customer name and email-id, 2 forms for the customer address and other details. We need one form to print out the details of customer. As to data entities, we need 20 for customer name and email-id, 20 for their address and 20 with each purchase. Calculate the cost estimate for the Programming effort and Total Effort. **10**

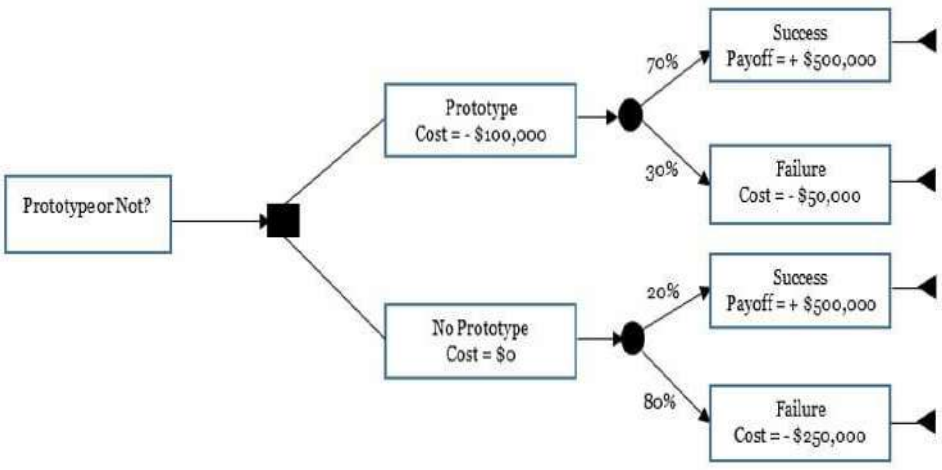
ii) The team estimates the time to develop a new system as follows: Most likely, the project takes 4 months. In the worst case, the completion takes 7 months, if there are no hurdles, the completion takes 2 months. Calculate the PERT Mean and Project Schedule Estimate and Discuss about the Confidence Level.

c) Analyze the efficiency of Bottom-up cost estimation technique in comparison with Top-down cost estimation with an example. **4**

UNIT - V

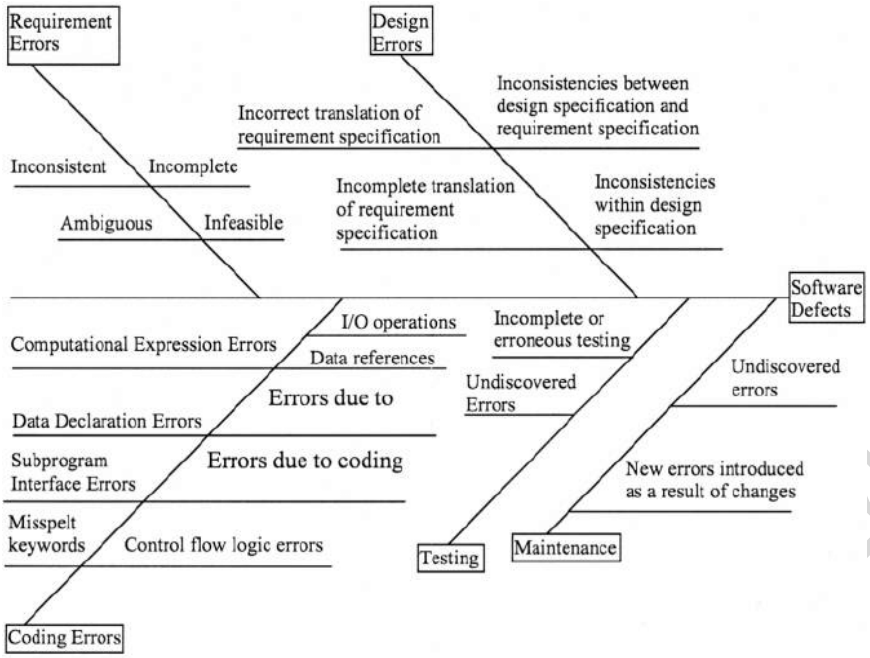
7 a) List and explain the Risk Strategies for Negative and Positive Risks. **6**

b) **7**



Analyze the above Decision tree and Explain the same with the notations used in the diagram. Calculate the EMV value of each branch of the tree. Which one would you select? Justify the reason for the same.

c) 7



Analyze how the above fishbone diagram helps in identifying the cause and effect for the problem and also explain the different notations used in the above diagram.

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B.M.S. College of Engineering, Bengaluru-560019

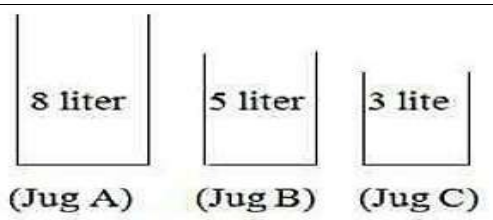
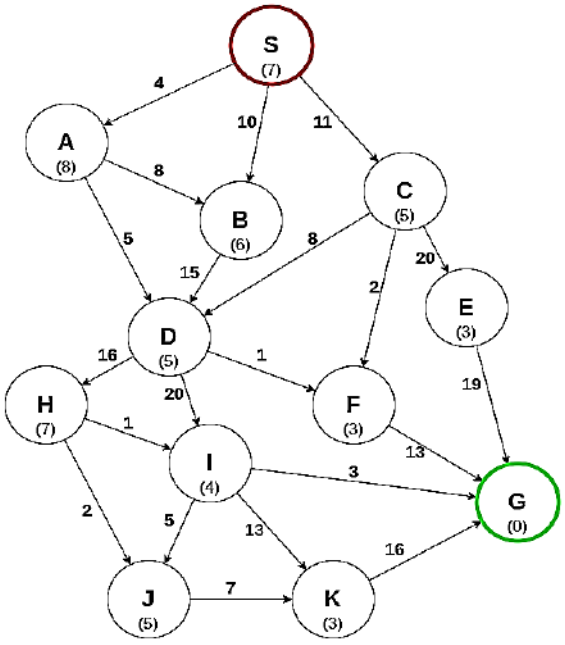
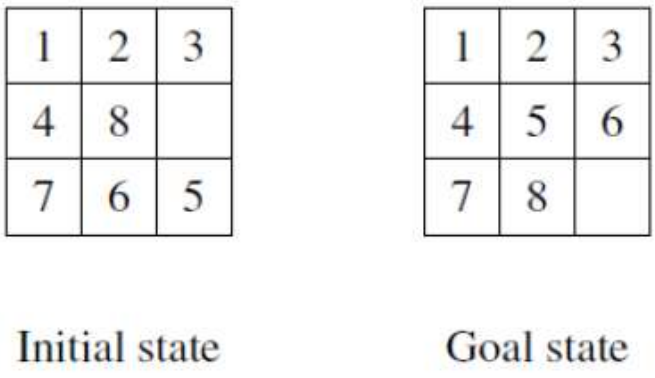
Autonomous Institute Affiliated to VTU

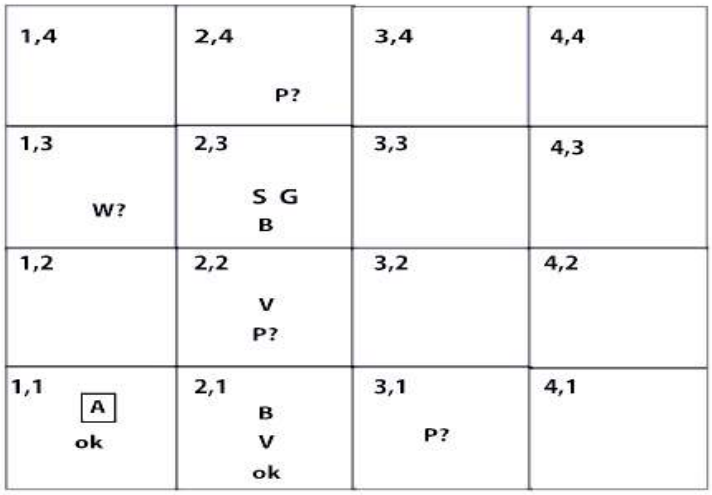
February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PCAIN / 20CS5PCAIP **Max Marks: 100**
Course: Artificial Intelligence

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Implement a Utility based agent for the vacuum environment. Assume that initially the environment with this agent has all possible square as dirty.	*CO1*	*PO1*	**05**
	b)	The **missionaries and cannibal's** problem are usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place. i. Formulate the problem precisely, making only those distinctions necessary to ensure a valid solution. ii. Why do you think people have a hard time solving this puzzle, given that the state space is so simple?	*CO1*	*PO1*	**10**
	c)	Analyze the PEAS Description for: i. Part Picking Robot ii. Satellite Image analysis System	*CO2*	*PO2*	**05**
		OR			
2	a)	You are provided with three jugs: one having the capacity to hold 3 gallons of water, 5 gallons of water and the other has the capacity to hold 8 gallons of water. There is no other measuring equipment available and the jugs also do not have any kind of marking on them. So, the agent's task here is to fill the 8-gallon jug with 4 gallons of water (Jug A, Jug B) by using only these three jugs and no other material. Initially, both our jugs are empty. Explain this Water Jug Problem using state space search. Generate Production rules for this problem.	*CO2*	*PO2*	**05**

						
		b)	Analyze the PEAS Description for: i. Ketchup producing Industry iv. Medical Diagnosis system	*CO2*	*PO2*	**10**
		c)	Infer a suitable agent architecture for an automated taxi driver. Justify your answer.	*CO1*	*PO1*	**05**
			UNIT - II			
	3	a)	Apply informed heuristic A* search algorithm for the given problem. Whether it is complete and optimal? What is the time and space complexity? Each edge has an associated weight & heuristic cost is given in parenthesis inside each node. 	*CO1*	*PO1*	**10**
		b)	Given the 8-puzzle shown in Figure below, use the hill-climbing algorithm with the Manhattan distance heuristic to find a path to the goal state. 	*CO1*	*PO1*	**10**

			UNIT - III			
	4	a)	Illustrate the resolution algorithm step by step and Prove that the sentence S is true in the given Propositional logic sentence: (P ∧Q) ∧ (P ⇒ R) ∧ [(Q ∧ R) ⇒ S]	*CO3*	*PO3*	**10**
		b)	Represent the following statements into First order logic representation. i) All parrots are birds and all birds are animals. ii) All plants are green or brown. iii) The widow slaps every woman who does not slap herself. iv)Some students are not smart. v) No birds are reptiles.	*CO2*	*PO2*	**10**
			OR			
	5	a)	Consider the following Wumpus world problem and prove that the Wumpus is in the room (1, 3). Consider the knowledge base given for the reference. Representation of Knowledge Base for Wumpus world is as given below: $\neg W_{11}$ $\neg S_{11}$ $\neg P_{11}$ $\neg B_{11}$ $\neg G_{11}$ V_{11} OK_{11} $\neg W_{12}$ ---- $\neg P_{12}$ ----- ---- $\neg V_{12}$ OK_{12} $\neg W_{21}$ $\neg S_{21}$ $\neg P_{21}$ B_{21} $\neg G_{21}$ V_{21} OK_{21} Following is the Simple KB for Wumpus world when an agent moves from room [1, 1], to room [2,1], 	*CO3*	*PO3*	**10**
		b)	Convert the following into FOL i) There are no leafy vegetables that are tasty and starchy. ii) Anyone who kills an animal is loved by no one. iii) Either everything is bitter or everything is sweet. iv) All animals either eat all plants or eat all smaller animals that eat some plants. v) All the courses in the Food Processing department are easy.	*CO2*	*PO2*	**10**

			UNIT - IV			
	6	a)	Conversion of Facts into FOL Prove by resolution that: "John likes peanuts" a. John likes all kind of food. b. Apple and vegetable are food c. Anything anyone eats and not killed is food. d. Anil eats peanuts and still alive e. Harry eats everything that Anil eats.	*CO3*	*PO3*	**10**
		b)	Infer whether the following pairs statements can be unified or not. If unification is possible, write the substitutions. Justify your answer. i) Human (Marcus) and Human (Julius) ii) Student(x) and Teacher(y) iii) Knows (John, F(x)) and Knows (y, F(G(y)) iv)Likes (Ram, x) and Likes (x, Raj) v) Loves(x,y) and Loves (z)	*CO2*	*PO2*	**05**
		c)	The Knowledge Base contains: – allergies(X) → sneeze(X) – cat(Y) ∧ allergicToCats(X) → allergies(X) – cat(felix) – allergicToCats(mary) Resolve by resolution for the goal state sneeze (mary)	*CO3*	*PO3*	**05**
			UNIT - V			
	7	a)	Consider a bag of three biased coins a, b, and c with probabilities of coming up heads of 20%, 60%, and 80%, respectively. One coin is drawn randomly from the bag (with equal likelihood of drawing each of the three coins), and then the coin is flipped three times to generate the outcomes X1, X2, and X3. **a**. Draw the Bayesian network corresponding to this setup and define the necessary Conditional Probability tables (CPTs). **b**. Calculate which coin was most likely to have been drawn from the bag if the observed flips come out heads twice and tails once.	*CO3*	*PO3*	**10**
		b)	Write the variable elimination algorithm and show how the optimization is achieved with respect to computations done.	*CO1*	*PO1*	**10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PCCPD **Max Marks: 100**
Course: Compiler Design

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Analyze the following line of code and show how this line is converted to target code in assembly language over the various phases of compiler. P = qr * rs+ 70.00	CO2	PO2	**7**
	b)	Construct a transition diagram to represent relational operators. Give a code segment for the implementation of a relational operator.	CO1	PO1	**10**
	c)	Differentiate between Interpreter and Compiler.	CO2	PO2	**3**
		UNIT - II			
2	a)	Eliminate Left recursion from the following grammar. E -> E + T | E-T | T T -> T * F | T/F | F F-> (E) | id	CO1	PO1	**5**
	b)	Analyze and design a Predictive Parser for the grammar. S -> (L) | a L -> L,S | S Also Construct the Predictive Parsing table.	CO2	PO2	**5**
	c)	Design a LR(0) Parser for the grammar S -> aSbS S -> bSaS S -> € And also parse the string "aabbab" give transition diagram.	CO2	PO2	**10**
		OR			
3	a)	Given the grammar A -> (A) A -> a i. Find LR(0) items ii. Give transition diagram	CO2	PO2	**10**

			iii. Construct SLR(1) Parsing table. iv. Show the Parsing steps for the string "((a))"			
		b)	Design LR(1) Parser and LALR parser for the grammar. S -> 0S1 S-> 01 and also parse the string "000111" for LALR parser.	*CO2*	*PO2*	**10**
			UNIT - III			
	4	a)	Consider the Context free grammar given below S-> En E-> E+T | E-T | T T-> T*F | T/F | F F-> (E) | digit n ->; where n represents end of file marker i)Obtain the SDD for the above grammar. ii)Construct the parse tree, syntax tree and annotated parse tree for the input string 5*6+7;	*CO1*	*PO1*	**8**
		b)	Give the Syntax directed translation of type int[2][3] and also given the Semantic rules for the respective productions.	*CO1*	*PO1*	**8**
		c)	List the differences between Synthesized and Inherited attributes.	*CO2*	*PO2*	**4**
			UNIT - IV			
	5	a)	Explain Static Single Assignment form(SSA).With an Example.	*CO1*	*PO1*	**6**
		b)	Give the three address code for the following i. a=b* - c + b * - c ii. if(A<B) then 1 else 0	*CO3*	*PO3*	**6**
		c)	Translate a = b * - c + b * - c into Quadruple , triple and indirect triple.	*CO3*	*PO3*	**8**
			OR			
	6	a)	Give Syntax directed translation for switch statement.	*CO2*	*PO2*	**6**
		b)	Obtain DAG for a + a * (b-c) + (b-c) * d .Also give steps for Construction of DAG.	*CO3*	*PO3*	**8**
		c)	Write the three address code for the following: In both position number and Symbolic labels. C=0 do{ if(a<b) then x++; else {x - -;} c + + }while(c<5)	*CO3*	*PO3*	**6**

			UNIT - V			
	7	a)	Generate simple machine code for the following three address code. Show the step by step contents of address descriptor and register descriptor. Assume there are three registers R1, R2, R3. Let a,b,c,d be live on exit from the block. Let t,u,v be temporary to the block. t=a-b u=a-c v=t+u a=d d=v+u	*CO2*	*PO2*	**10**
		b)	Generate three address code , Basic Block and flow graph for i=1 do Sum = sum + a[i] * b[i] While(i<=20)	*CO3*	*PO3*	**10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PCCRP / 20CS6PCCNS **Max Marks: 100**
Course: Cryptography / Cryptography and Network Security

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	*CO*	*PO*	Marks
1	a)	Demonstrate with a suitable example how mono alphabetic substitution cipher is vulnerable to frequency analysis attack.	CO1	PO1	**5**
	b)	Given that Z_7 = {1, 2, 3, 4, 5, 6} * mod 7 is a group, write all the cyclic subgroups of different orders of Z_7. Is Z_7 a cyclic group?	CO1	PO1	**10**
	c)	The ciphertext GEZXDS was encrypted by a Hill cipher with a 2 * 2 matrix. The plaintext is "solved". Find the encryption matrix M.	CO1	PO1	**5**
		OR			
2	a)	Encrypt the message "the house is being sold tonight" using the following ciphers. Ignore the space between words. Decrypt the message to get the plaintext: a. Vigenere cipher with key: "dollars" b. Autokey cipher with key = 7 c. Affine Cipher with key (15,20)	CO1	PO1	**10**
	b)	Show the steps involved in multiplication of two polynomials: $f(x) = x^6 + x^4 + x^2 + x + 1$ and $g(x) = x^7 + x + 1$ in GF(2^8) using the efficient algorithm for multiplication using n-bit words. Consider $x^8 + x^4 + x^3 + x + 1$ as the irreducible polynomial.	CO1	PO1	**10**
		UNIT - II			
3	a)	Draw and explain Mix Columns transformation in AES with an example	CO1	PO1	**5**
	b)	Explain key Generation in DES with a neat figure.	CO1	PO1	**10**
	c)	Illustrate how double DES is vulnerable to meet-in-the-middle attack.	CO2	PO2	**5**
		UNIT - III			
4	a)	Apply CRT to find the integer x which leave a remainder of 6, 13, 9 and 19 when divided by 11, 16, 21 and 25 respectively.	CO1	PO1	**10**

		b)	Using quadratic residues, solve the following congruences: a) $x^2 \equiv 4 \bmod 7$ b) $x^2 \equiv 5 \bmod 11$ c) $x^2 \equiv 7 \bmod 13$ d) $x^2 \equiv 12 \bmod 17$	CO1	PO1	**10**
			UNIT - IV			
	5	a)	Explain with an example the working of SHA algorithm.	CO1	PO1	**8**
		b)	In ElGamal cryptosystem, given the prime p = 31: a. Choose an appropriate values for e_1 and d, then calculate e2. b. Encrypt the message "HELLO". Use 00 to 25 for encoding. Use different blocks to make P < p. c. Decrypt the ciphertext to obtain the plaintext. Clearly show all the steps involved in encryption and decryption.	CO1	PO1	**12**
			OR			
	6	a)	Encrypt the message block M = 2 using RSA with the following parameters: e = 23 and n = 233 × 241. Compute a private key (d, p, q) corresponding to the given above public key (e, n)	CO3	PO3	**5**
		b)	Consider the elliptic curve $E_{11}(1,6)$; that is, the curve is defined by $y^2=x^3+x+6$ with a modulus of p=11. i. Determine all the points in $E_{11}(1,6)$. **ii.** Consider the point G= (2,7). Compute the multiple of G from 2G through 4G	CO3	PO3	**10**
		c)	Demonstrate cycling attack for the RSA cryptosystem.	CO1	PO1	**5**
			UNIT - V			
	7	a)	Demonstrate with an example how digital signature satisfies the following properties: (1) Message authentication (2) Message integrity (3) Nonrepudiation (4) Confidentiality	CO2	PO2	**8**
		b)	Using the RSA Digital Signature scheme, let p = 809, q = 751 and d = 23. Calculate the public key e. Then do the following: a. Sign and verify a message with M1 = 101 Calculate the signature S1. b. Sign and verify a message with M2 = 51. Calculate the signature S2. c. Show that if M = M1 × M2 = 5151, then S = S1 × S2.	CO1	PO1	**12**

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B.M.S. College of Engineering, Bengaluru-560019

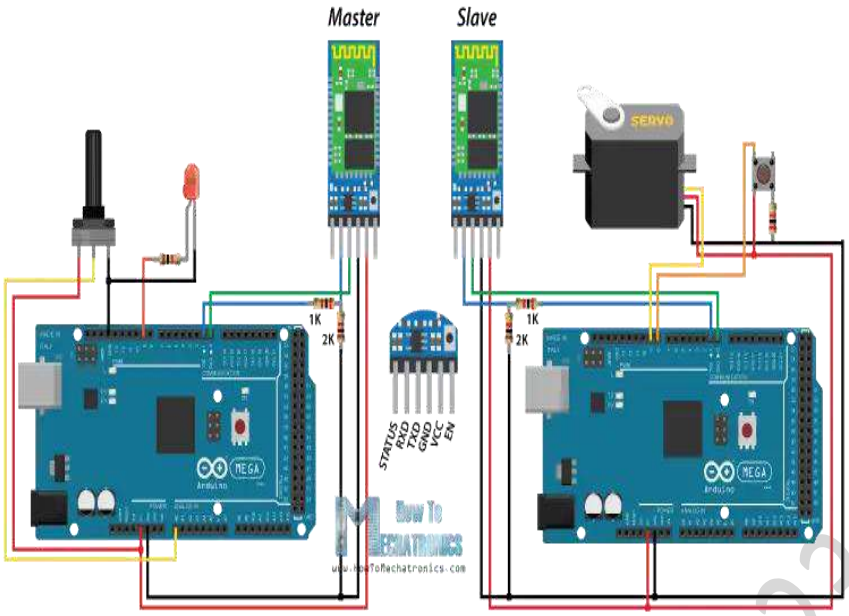
Autonomous Institute Affiliated to VTU

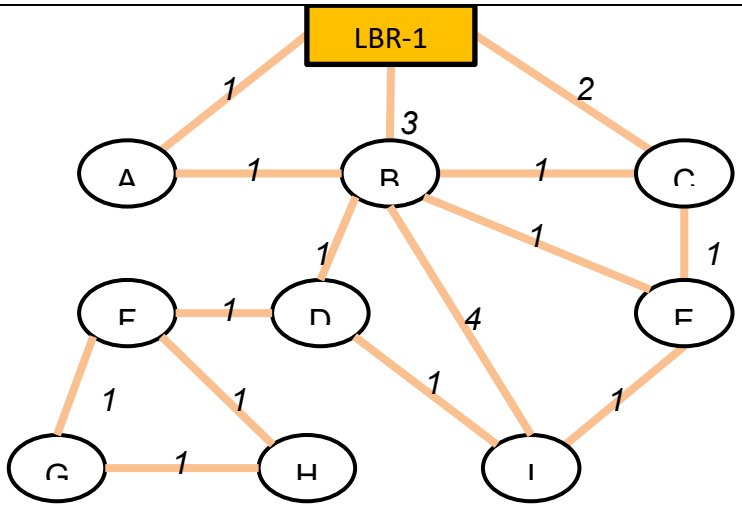
February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PCIOT / 20CS5PEIOT **Max Marks: 100**
Course: Internet of Things

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

		UNIT - I	CO	PO	Marks
1	a)	Describe REST based communication API and its Architectural Constraints	*CO1*	*PO1*	**06**
	b)	Apply the knowledge of different IOT levels and Analyze the suitable IoT levels for designing Smart irrigation system and package tracking system	*CO2*	*PO2*	**08**
	c)	Design and implement an IOT system for smart home where the lights are ON/OFF based on light intensity and presence of human in the room.	*CO3*	*PO3*	**06**
		OR			
2	a)	Illustrate the features and pin configuration of Arduino Board	*CO3*	*PO3*	**06**
	b)	Design and Implement a smart irrigation system where depending on the moisture levels a motor is switched ON/OFF and if a animal enters the farm an alarm is raised to the owner of the farm	*CO3*	*PO3*	**08**
	c)	Identify and list the sensors used to sense closeness of an object relative to another object and illustrate its working principle	*CO3*	*PO3*	**06**
		UNIT - II			
3	a)	Write a neat block diagram of IOT Reference Architecture Model and explain the functional responsibility of layer that convert network data flows into information that is suitable for storage and higher level processing	*CO2*	*PO2*	**06**
	b)	Analyze the circuit given below, List the components and Write the server side and client-side program to make the circuit operational.	*CO3*	*PO3*	**08**

						
		c)	Write and explain the commands to configure two ESP8266 modules as access point and station respectively. Use this Configuration to switch on the buzzer from the commands received from the station	*CO3*	*PO3*	**06**
			UNIT - III			
	4	a)	Describe the architecture of Software defined networks and the functionality of each layer	*CO2*	*PO2*	**06**
		b)	Design and implement a Raspberrypi program to control the display of LED through push button.	*CO3*	*PO3*	**08**
		c)	Demonstrate how CoAP protocol is different from HTTP protocol and illustrate the method to achieve reliability in CoAP	*CO1*	*PO1*	**06**
			OR			
	5	a)	Explain features of 6LoWPAN adaptation layer and mesh addressing headers in the context of 802.15.4 network	*CO1*	*PO1*	**06**
		b)	Analyze the Type of messages exchanged in RPL. Construct a RPL DODAG for the topology with OF is to minimize the ETx and explain the steps.	*CO1*	*PO1*	**08**

						
	c)	Assume that a Garage door opener system has a light controller which can control the locking of the Garage door Write a sequence to register the light controller in a server. Support your design with appropriate sequence diagram.	*CO1*	*PO1*	**06**
		UNIT - IV			
6	a)	Identify and explain the IOT cloud services with examples	*CO1*	*PO1*	**06**
	b)	Demonstrate Edge analytics with the framework for analytics in IOT and explain the two types of IOT Analytics	*CO2*	*PO2*	**08**
	c)	Differentiate between Database Management system and Data stream management system at Data level, processing level and query level.	*CO2*	*PO2*	**06**
		UNIT - V			
7	a)	Paraphrase the importance of Data analytics in IOT.	*CO2*	*PO2*	**06**
	b)	Describe Feature selection using wrapper based technique and write a python program considering 5 parameters of air pollution dataset	*CO2*	*PO2*	**08**
	c)	Identify and explain the key challenges of data stream mining as compared to traditional data mining.	*CO2*	*PO2*	**06**

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B.M.S. College of Engineering, Bengaluru-560019

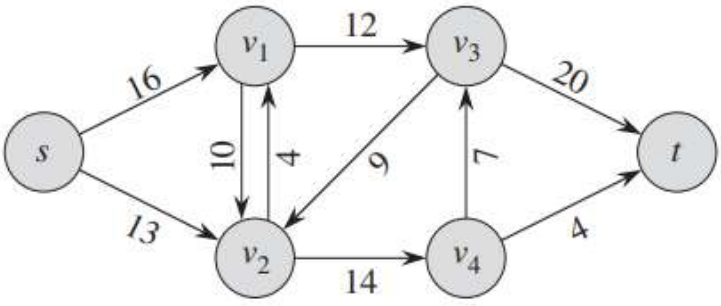
Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PEAAM / 20CS5PEAAG **Max Marks: 100**
Course: Advanced Algorithms

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

		UNIT - I	CO	PO	Marks
1	a)	Apply dynamic programming technique to find edit distance between S= "hello" and T= "keep".	CO1	PO1	5
	b)	Justify how Matrix Chain Multiplication reduces number of multiplications with an example.	CO2	PO2	5
	c)	Design dynamic programming based algorithm for solving rod cut problem. Apply the same for the below instance and find solution for rod of length=8. Length i: 1 2 3 4 5 6 7 8 9 10 Price Pi: 1 5 8 9 10 17 17 20 24 30	CO1,3	PO1,3	10
		UNIT - II			
2	a)	Apply Ford-Fulkerson algorithm to find maximum flow in the below network. Also write Ford-Fulkerson algorithm. 	CO1	PO1	8
	b)	Design a merge sort algorithm to sort n numbers for: i. Merge is not multithreaded ii. Merge is also multithreaded compare speedup achieved in both cases.	CO2,3	PO2,3	12
		OR			

	3	a)	Design an algorithm for Multithreaded Matrix Multiplication. What is the speedup achieved with this?	*CO2,3*	*PO2,3*	**10**
		b)	How Ford-Fulkerson algorithm can be used to solve Maximum Bipartite problem? Explain with an example.	*CO2*	*PO2*	**6**
		c)	Explain the use of keywords "spawn" and "sync" in Multithreaded programming with an example.	*CO1*	*PO1*	**4**
			UNIT - III			
	4	a)	Apply Rabin Karp algorithm to find Pattern P= "215" in Text T= "33456732156". Use Mod 11 and also find number of spurious hits. Also compare Naïve string matching with Rabin Karp algorithm.	*CO1,2*	*PO1,2*	**10**
		b)	Design an algorithm based on Finite Automata for searching a pattern P in a given text T. Apply the same for Pattern P= "abaab" and Text T= "ababbaaabaabab".	*CO1,3*	*PO1,3*	**10**
			OR			
	5	a)	Write KMP string matching algorithm. Apply the same for finding Pattern P= "abaab" in Text T= "ababbaaabaab".	*CO1,3*	*PO1,3*	**10**
		b)	Design pseudo code for Horspool string matching. Apply the same for Text T= "JIM_SAW_ME_IN_BARBERSHOP" and Pattern P= "BARBER".	*CO1,3*	*PO1,3*	**10**
			UNIT - IV			
	6	a)	Convert the below LPP to Standard form: Minimize 2a-b Subject to a - b <=0 a + b >0 a >=0	*CO1*	*PO1*	**5**
		b)	Formulate Maximum Flow problem as LPP.	*CO1*	*PO1*	**5**
		c)	Solve the below LPP using Simplex method: Maximize $z=2x_1-x_2+2x_3$ subject to $2x_1+x_2<=10$ $x_1+2x_2-2x_3<=20$ $x_2+2x_3<=5$ $x_1,x_2,x_3>=0$	*CO1*	*PO1*	**10**
			UNIT - V			
	7	a)	Design pseudo code for checking whether a pair of line segments intersect or not. Apply the same to check line segment (P1,P2) intersects with (P3,P4). P1= (10,10) P2=(10,30), P3=(30,30) and P4=(40,40).	*CO1,3*	*PO1,3*	**10**
		b)	Explain the working of Jarvis's March algorithm for finding Convex Hull with an example.	*CO1*	*PO1*	**10**

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B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 22CS5PEDEV **Max Marks: 100**
Course: Data Exploration and Visualization

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

			UNIT - I	*CO*	*PO*	Marks
1	a)		Discuss the common data types used to represent columns in a dataset with an example. What are the different measurement scales for these data types and possible statistics can be performed on it?	*CO1*	*PO1*	**10**
	b)		Discuss the steps in Exploratory Data Analysis.	*CO1*	*PO1*	**10**
			UNIT - II			
2	a)		You are given a dataset containing information about customers' orders. The dataset has the following columns. The dataset may contain missing values and duplicates. Order_ID: Unique identifier for each order. Customer_ID: Unique identifier for each customer. Product_ID: Identifier for the purchased product. Quantity: Number of units of the product ordered. Order_Date: Date when the order was placed. Total_Amount: Total amount spent on the order. • Find duplicate rows in the 'Oder_ID' column of the DataFrame and remove the duplicates. • To find the total number of missing values in the dataset • Drop rows which contains all null values. • Drop rows where Quantity columns have missing values. • Check for missing values in a Keep the row which has Threshold (3) of NoT NULL values.	*CO2*	*PO2*	**10**
	b)		A dataset containing information about the temperature readings for different days. The dataset has the following columns: Date: The date of the temperature reading.	*CO2*	*PO2*	**05**

			'Date': ['2021-01-01', '2021-01-02', '2021-01-03', '2021-01-04', '2021-01-05', '2021-01-06'], Temperature: The recorded temperature for each day. 'Temperature': [25, 28, np.nan, 22, np.nan, 30] Perform the following • Load the dataset into a DataFrame. • Explore the pattern of temperature fluctuations and based on the pattern observed in the temperature choose whether forward filling or backward filling is more suitable for this dataset. • Provide a brief justification for your choice.			
	c)		Suppose you have a dataset containing information about customers' purchases at a store. The dataset (customer_data.csv) includes columns: 'Customer_ID', 'Age', 'Gender', 'Purchase_Amount'. Your task is to perform random sampling to select a subset of 20 customers from this dataset for a survey.	*CO1*	*PO1*	**05**
			UNIT - III			
3	a)		You are given a dataset containing information about sales transactions. The dataset has the following columns: Product: The name of the product. Category: The category to which the product belongs. Price: The price of the product. Quantity: The quantity of the product sold. perform the following tasks using the groupby() function: • Calculate the total revenue (Price * Quantity) for each product. • Find the average price for each category. • Determine the product with the highest total revenue.	*CO1*	*PO1*	**10**
	b)		Define the terms "skewness" and "kurtosis." How do they describe the shape of a distribution?	*CO1*	*PO1*	**10**
			UNIT - IV			
4	a)		Explain the characteristics of time series data.	*CO1*	*PO1*	**06**
	b)		Discuss the statement “Correlation does not imply causation”.	*CO1*	*PO1*	**05**
	c)		In the game of baseball the objective is to win games by scoring more runs than the opposing team. Runs can only be scored if someone gets on base. Traditionally, batting average (which is actually a proportion of hits to at bats) has been used as one of the primary measures of player success. An alternative is slugging percent which is the ratio of total number of bases reached during an at bat to the number of at bats. A walk or single counts as one base, a double counts as two bases, etc. The dataset contains: • Team batting average. • Team slugging percentage, and	*CO2*	*PO2*	**09**

			• Team runs scored. from 10 Major League Baseball teams randomly selected from the 2012 and 2013 seasons. The followings are result gathered on the data i. Mean batting average and Standard deviation for batting average. ii. Mean runs scored and Standard deviation for runs scored. iii. Making a scatter plot of team batting average and team runs scored. Identify what type of analysis (Univariate, Bivariate, and Multivariate) is performed on the data based on above information. Justify your answer.			
			OR			
	5	a)	Explain the purpose of multivariate analysis, and how does it differ from univariate and bivariate analyses?	*CO2*	*PO2*	**10**
		b)	Explain what univariate time series data with an example is.	*CO1*	*PO1*	**05**
		c)	Discuss any two benefits of resampling time series data.	*CO1*	*PO1*	**05**
			UNIT - V			
	6	a)	Explain how position (Coordinate system and Axes) on the graph can be used as a mapping aesthetic. Discuss various factors to be considered while defining data units in the positional scale on the graph.	*CO1*	*PO1*	**10**
		b)	Discuss commonly used aesthetics in data visualization and what type of data it can capture?	*CO1*	*PO1*	**05**
		c)	You are provided with a dataset containing information about the sales performance of three different products (A, B, and C) across two different regions (North and South) for the past month. The dataset has the following columns: Product: The type of product (A, B, or C). Region: The region where the sales occurred (North or South). Sales: The number of units sold. What is the appropriate visualization to represent the above dataset. Provide your justification.	*CO2*	*PO2*	**05**
			OR			
	7	a)	Explain the purpose of using bins in a histogram when visualizing data distribution and how does the choice of bin width in a histogram impact the interpretation of the data distribution with an example?	*CO2*	*PO2*	**10**
		b)	Discuss Empirical Cumulative Distribution Functions and Q-Q Plots.	*CO1*	*PO1*	**10**

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U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2024 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCCON **Max Marks: 100**
Course: Computer Networks

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1 a) Name the layers which implements same functionalities in OSI Model and explain the same with reasons. **4**

b) Explain the process of Interleaving in TDM. **4**

c) Draw the graph of the Manchester scheme using each of the following data streams, assuming that the last signa11evel has been positive. **6**

a. 00000000
b. 11111111
c. 01010101
d. 00110011

d) Ten sources, six with a bit rate of 200 kbps and four with a bit rate of 400 kbps are to be combined using multilevel TDM with no synchronizing bits. Answer the following questions about the final stage of the multiplexing: **6**
a. What is the size of a frame in bits?
b. What is the frame rate?
c. What is the duration of a frame?
d. What is the data rate?

UNIT - II

2 a) Illustrate the need for imposing restrictions on Ethernet frame length and Explain 802.3 MAC Frame format **10**

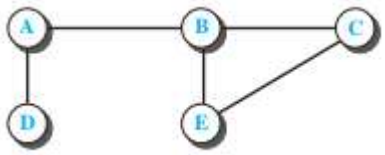
b) Design a bidirectional algorithm for the Simplest Protocol using piggybacking. Note that the both parties need to use the same algorithm. **6**

c) A network using CSMA/CD has a bandwidth of 10 Mbps. If the maximum propagation time(including the delays in the devices and ignoring the time needed to send a jamming signal) is 25.6 μs, what is the minimum size of the frame? **4**

OR

3	a)	Given the dataword 1010011110 and the divisor 10111, Use polynomials and show i) The generation of the codeword at the sender site. ii) The checking of the codeword at the receiver site.	**6**
	b)	Compare byte stuffing with bit stuffing	**6**
	c)	Explain the role of NAV CSMA/CA with a neat diagram.	**8**

UNIT - III

4	a)	Consider the below graph, apply the Path vector algorithm for the same. Draw the spanning tree and Path vector table for all the nodes in the graph.  	**8**
	b)	In distance-vector routing, bad news (increase in a link metric) will propagate slowly. In other words, if a link distance increases, sometimes it takes a long time for all nodes to know the bad news.We assume that a four-node internet is stable, but suddenly the distance between nodes B and C, which is currently 2, is increased to infinity (link fails). Show how this bad news is propagated, and find the new distance vector for each node after stabilization.	**8**
	c)	What is the need for TTL in IP header format? Illustrate with an example	**4**

OR

5	a)	An organization is granted a block of addresses with the beginning address 14.24.74.0/24. The organization needs to have 3 subblocks of addresses to use in its three subnets. One subblock of 10 addresses , one subblock of 60 addresses, and one subblock of 120 addresses. Design the subblocks.	**6**
	b)	Compare and contrast the IPv4 header with the IPv6 header. Create a table to compare each field and explain the new fields in IPV6.	**8**
	c)	Consider sending a 3400-byte datagram into a link that has an MTU of 700 bytes. Suppose the original datagram is stamped with the identification number 520. How many fragments are generated? What are the values in the various fields in the IP datagram(s) generated related to fragmentation?	**6**

UNIT - IV

6	a)	In a network using the Go-Back-N protocol with m = 3, calculate the window size. The values of variables are $S_f = 74$, $S_n = 78$, and $R_n = 76$. Assume that the network does not duplicate or reorder the packets. a. What are the sequence numbers of data packets in transit? Explain b. What are the acknowledgment numbers of ACK packets in transit? Explain c. Draw a diagram depicting the above scenario.	**6**

b) Analyze the situation. Alice and Bob have no access to telephones or the Internet (think about the old days) to establish their next meeting at a place far from their homes. **8**

i. Suppose that Alice sends a letter to Bob and defines the day and the time of their meeting. Can Alice go to the meeting place and be sure that Bob is there?

ii. Suppose that Bob responds to Alice's request with a letter and confirms the date and time. Can Bob go to the meeting place and be sure that Alice is there?

iii. Suppose that Alice responds to Bob's letter and confirms the same date and time. Can either one go to the meeting and be sure that the other person is there?

iv. Analyse and conclude the drawback of this situation and how it can overcome

c) Analyse Tahoe TCP for the following scenario with a diagram: set the *ssthresh* value for 16 MSS. The station is now in the slow-start state with *cwnd* = 1 MSS and timeout occurs after third RTT. TCP sets new *ssthresh* = 4 MSS. provide the values of *cwnd, ssthresh,* and the current and the next state of the station after the following events: three duplicate ACKs arrives when cwnd = 12 MSS, followed by non duplicate ACKs, and followed by a connection termination after RTT 20 **6**

UNIT - V

7 a) Consider the URL for the base HTML file and 3 JPEG images residing on the same server, http://www.bmsce.ac.in/cse/home.html. Analyze and illustrate the steps involved in transferring a webpage from Server to the Client in case of non-persistent and persistent connections. **8**

b) In FTP, a user (Jane) wants to retrieve an EBCDIC file named *huge* from */usr/ users/report* directory using the ephemeral port 61017. The file is so large that the user wants to compress it before it is transferred. Show all the commands and responses. **6**

c) Differentiate between Recursive Resolution and Iterative Resolution with a neat diagram **6**

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U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science and Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCSEG **Max Marks: 100**
Course: Software Engineering **Date: 01.03.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1	a)	Define Software Engineering. Illustrate the professional and ethical responsibilities that a Software Engineer should have.	**6**
	b)	Design a Software Requirements document for an online furniture ordering system.	**8**
	c)	Illustrate the two fundamental types of evolutionary development. Identify the problems existing in evolutionary approach.	**6**

OR

2	a)	List the additional information to be included when a standard form is used for specifying functional requirements.	**6**
	b)	State Code of Ethics and Professional Practice as specified by ACM/IEEE-CS force. Suggest an appropriate example that illustrates each clause.	**8**
	c)	Design a template using structured natural language to capture the requirements of a fuel delivery system.	**6**

UNIT - II

3	a)	Analyze the Library Management System that catalogues copyrighted articles from various countries. Identify the principal viewpoints and organize diagram.	**6**
	b)	i) Draw a context model for a patient information system in a hospital. You may make any reasonable assumptions about the other hospital systems that are available, but your model must include a patient admissions system and an image storage system for X-rays, as well as other diagnostic records. ii) Develop a sequence diagram showing the interactions involved when a student registers course in a university. Courses may have limited enrolment, so the registration process must include checks that enrolements are available or not. Assume that the student accesses an electronic course catalogue to find out about the available courses.	**8**

c) Describe the categories of requirement based on evolution perspective. Demonstrate the classification of requirements that are likely to change. **6**

UNIT - III

4 a) Describe the various proposals to identify object class. Identify object classes in the weather station system **6**

b) Identify and explain an appropriate control model for the following systems: Give reasons for your answer **8**

- A batch processing system that takes information about hours worked and pay rates and prints salary slips and bank credit transfer information
- A set of software tools that are produced by different vendors, but which must work together
- A television controller that responds to signals from a remote-control unit

c) Identify possible objects in the following system and develop an object-oriented design for that system. You may make any reasonable assumptions about the systems when deriving the design. **6**

A petrol (gas) station is to be set up for fully automated operation. Drivers swipe their credit card through a reader connected to the pump; the card is verified by communication with a credit company computer; and a fuel limit is established. The driver may then take the fuel required. When fuel delivery is complete and the pump hose is returned to its holster, the driver's credit card account is debited with the cost of the fuel taken. The credit card is returned after debiting. If the card is invalid, the pump returns it before fuel is dispensed.

UNIT - IV

5 a) Describe the four "organizational paradigms" suggested by Constantine for software engineering teams **6**

b) i) Differentiate between LOC Based Estimation and FP based Estimation. **8**
ii)An organizations average productivity is 12 FP/pm. The average labor rate is $15600 per month. If a proposed project has a count total of 560 and the Value Adjustment factor (VAF) is 34.
Calculate:

(I) Cost per Functional Point
(II) Overall Project Cost
(III) Estimated effort in person-months

c) Consider the task of developing a software for Automated University marks card generation system. The scheduling of this system must account for the following requirement: **6**

- Initially the work should start with design of a control terminal (T0) class for no more than eleven working days.
- Next, the classes for student user (T1) and faculty user (T2) should be designed in parallel, assuming that the elaboration of student user takes

no more than six days, while the faculty user needs four days.

- When the design of student user completes network protocol (T4) is to be developed, it is a subtask that requires eleven days, and simultaneously network management routines (T5) is to be designed that takes up to seven days.
- After the termination of the faculty user subtask, a database directory (T3) should be made for nine days to maintain information about the marks of students and their information.
- The completion of the network protocol and management routines should be followed by design of the overall network control (T7) procedures for up to eight days.
- The Database directory design should be followed by a subtask elaboration of users of the system (T6), which takes eleven days; the software engineering process terminates with testing (T8) for no more than four days.

Design Time-Line chart for the above System along with milestones

UNIT - V

6	a)	Illustrate the principles of agile methods. Identify the reasons why the principles underlying agile methods are sometimes difficult to realize.	**6**
	b)	Differentiate between Whitebox and Blackbox testing with relevant example and diagram.	**8**
	c)	Identify the strategic options when a organization has limited budget for maintaining and upgrading their legacy system evolution. When would you normally replace all or part of a system rather than continue maintenance of the software (with or without reengineering)?	**6**

OR

7	a)	Explain the importance of program inspection. Identify and elaborate inspection process.	**6**
	b)	Illustrate the concept of partition testing approach and apply this concept for a binary search routine with a neat diagram.	**8**
	c)	Demonstrate software testing workbench and the tools that might be included in such a testing workbench.	**6**

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VU.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Computer Science And Engineering **Duration: 3 hrs.**
Course Code: 20CS5PCSEG **Max Marks: 100**
Course: Software Engineering **Date: 27.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably assumed.

UNIT - I

1	a)	Discuss the responsibilities that the software engineers should have towards profession and society. State ACM/IEEE code of Ethics and professional practice that software engineers should adhere to.	**6**
	b)	Analyze and classify the Non-functional requirements hierarchy diagram of an interactive system that allows employees of an organization to have private meetings with their clients while working remotely from home. Explain with relevant diagram.	**8**
	c)	Write plausible user requirement definition and system requirements specification for the following functions: i) The cash-dispensing function in a bank ATM ii)An unattended petrol (gas) pump system that includes credit card reader to deliver the amount of fuel required.	**6**

OR

2	a)	Explain the key challenges facing software engineering.	**4**
	b)	Giving reasons for your answer based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems: i) A bank accounting system that replaces an existing system. ii) A virtual reality system to support software maintenance. iii) A system to control anti-lock braking in a bike iv) An interactive system that allows metro rail passengers to find train terminals installed in stations.	**8**
	c)	Consider the vaccination drive service where citizens of a country who are in the age group of 15 to 60 should be given vaccination to fight against the deadly virus. The registration process can be done online or directly get vaccinated at various health centers setup by the government. Capture the requirement specification with respect to the age group and doses to be given using structured natural language template.	**8**

UNIT - II

3 a) Eliciting and understanding stakeholder requirements is difficult for several reasons Justify. **5**

b) A software system is to be developed to manage the records of patients who enter a clinic for treatment. The records include records of all regular patient monitoring (Temperature, BP etc), treatments given, patients reactions and so on. After treatment the records of their stay are sent to patients doctor who maintains their complete medical record. **7**
Identify the principal viewpoints which might be taken into account in the specification of this system and organise these using a view point hierarchy diagram and explain.

c) Consider a Tour and Travel Management System. **8**
a. List three actors. Explain the relevance of each actor.
b. List four use cases at the comparable level of abstraction and prepare a use case diagram for Tour and Travel Management system. Summarize the purpose of each use case with a sentence.
c. Design the Sequence diagram corresponding to any one scenario.
d. Design the State machine model for booking scenario.

UNIT - III

4 a) Explain the Object Oriented Decomposition for an invoice processing system with a neat diagram. Discuss their advantages and disadvantages. **6**

b) i) Analyze the system and suggest an appropriate structural model for the following. Give reasons for your answers **8**
- A computer-controlled video conferencing system that allows video, audio and computer data to be visible to several participants at the same time.
- A robotic floor cleaner that is intended to clean relatively clear spaces such as corridors. The cleaner must be able to sense walls and other obstructions.

ii) Analyze the system and suggest an appropriate control model for the following. Give reasons for your answers
- A batch processing system that takes information about hours worked and pay rates and also prints salary slips, bank credit transfer information.
- A set of software tools that are produced by different vendors, but which must work together.

c) Identify possible objects in the following systems and develop an object-oriented design for them. You may make any reasonable assumptions about the system when deriving the design. **6**
i) Weather station system.
ii) Loan Management system.

UNIT - IV

5 a) Identify the type of risks that are likely to be encountered as a software is built. **4**

b) If an organization average productivity is 10 Function Point(FP) per month at the burdened labour rate of $12000 per month. Given an information domain value count of 420 and ∑(Fi) is 55. Calculate **8**

i) FP Estimate
ii) Cost per FP
iii) Total project cost
iv) Estimates effort in person-months

c) Design the Task network and Time line chart for a developing a software for Online Entrance Exam Management system assuming minimum of 8 tasks, 4 milestones and 5 tasks having dependencies and also show the critical path for your design. **8**

UNIT - V

6 a) Define the objective and strategies involved in Cleanroom software development approach with a neat diagram. **6**

b) Consider that an organization has 25 legacy systems. Analyze how the quality and the business value of each of these systems is assessed and compared with others by plotting it on a chart showing relative business value and system quality. Discuss what are the different clusters that could be formed and explain your answer. **8**

c) Using your knowledge of java, C++ or other programming language, derive a checklist of common errors (not syntax errors) that could not be detected by a compiler but that might be detected in a program inspection. **6**

OR

7 a) Differentiate between Black box and White box testing. **6**

b) Consider the "Binary Search routine" Write the specification of a search routine. Analyze the equivalence partitions for search routine with suitable test cases. Draw the corresponding flow graph for a binary search routine find the number of independent paths to be tested. **8**

c) Write minimum of 10 test cases to check the functionality of the shopping cart of an e-commerce website **6**

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U.S.N.										

B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

February/March 2022 Semester End Main Examinations

Programme: B.E. | **Semester: V**
Branch: Computer Science And Engineering | **Duration: 3 hrs.**
Course Code: 20CS5PCSEG | **Max Marks: 100**
Course: Software Engineering | **Date: 22.02.2022**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may suitably assumed.

UNIT - I

1 a) Define Software Engineering. Illustrate the key challenges faced by Software Engineering. **6**

b) Giving reasons for your answer based on the type of system being developed, suggest the most appropriate generic software process model that might be used as a basis for managing the development of the following systems: **8**

i) A system to control anti-lock braking in a car
ii) A virtual reality system to support software maintenance
iii) A university accounting system that replaces an existing system
iv) An interactive travel planning system that helps users plan journeys with the lowest environmental impact

c) State the ACM/IEEE 1999 Software Engineering code of ethics and professional practice **6**

OR

2 a) Discuss the advantages and disadvantages of incremental development process. **6**

b) List a set of non-functional requirements for the ticket-issuing system, setting out its expected reliability and response time and explain in detail with a neat diagram **8**

c) Illustrate the Professional and ethical responsibilities that Software Engineer should have **6**

UNIT - II

3 a) A software system is to be developed to manage the records of patients who enter a clinic for treatment. The records include records of all regular patient monitoring (temperature, blood pressure, etc.), treatments given, patient reactions and so on. After treatment, the records of their stay are sent to the patient's doctor who maintains their complete medical record. Identify the principal viewpoints which might be taken into account in the specification of this system and organize these using a viewpoint hierarchy diagram. **6**

b) Using your knowledge of how an ATM is used, develop a set of use-cases, identify the interactions and explain the operations that could serve as a basis for understanding the requirements for an ATM system for i)Withdrawal of cash ii) Display balance. **8**

c) Develop a sequence diagram showing the interactions involved when a student registers for a course in a university. Courses may have limited enrolment, so the registration process must include checks that places are available. Assume that the student accesses an electronic course catalogue to find out about available courses. **6**

UNIT - III

4 a) Describe Repository model with appropriate example. State the advantages and disadvantages of the repository model. **6**

b) Giving reasons for your answer, suggest an appropriate structural model for the following systems: **8**

i) An automated ticket-issuing system used by passengers at a railway station

ii) A computer-controlled video conferencing system that allows video, audio and computer data to be visible to several participants at the same time

iii) A robot floor-cleaner that is intended to clean relatively clear spaces such as corridors. The cleaner must be able to sense walls and other obstructions.

c) Using the UML graphical notation for object classes, design State machine model for an automatic washing machine that models different programs for different types of clothes **6**

UNIT - IV

5 a) An Organizations average productivity is 16FP/pm. The Average labor rate is $5600 per month. if the proposed project has a count total of 479 and VAF is 56. Calculate **6**

i)Cost per Functional point

ii)Overall project cost

iii)Estimated effort in person months

b) Define a Macroscopic scheduling. Draw time line for macroscopic project schedule for SafeHomeAssured.com webApp. **8**

c) Describe RMMM plan with respect to Risk Information sheet **6**

UNIT - V

6 a) Illustrate with a neat diagram the tools that are included in RAD environment **6**

b) A software manager is involved in the project development of a software design support system that supports the translation of software requirements to a formal software specification. Comment on the advantages and disadvantages of the following development strategies: **8**

i) Develop a throw-away prototype, evaluate it then review the system requirements. Develop the final system using C.
ii) Develop the system from the existing requirements using Java, then modify it to adapt to any changed user requirements.
iii) Develop the system using incremental development with a user involved in the development team.

c) Analyze the problems in developing performance tests for a distributed database system such as the LIBSYS system. **6**

OR

7 a) Illustrate path testing approach of test case design by drawing a flow graph for a binary search routine. **6**

b) Analyze why program inspections are an effective technique for discovering errors in a program. Write the types of error that are unlikely to be discovered through inspections. **8**

c) Identify the strategic options for legacy system evolution. When would you normally replace all or part of a system rather than continue maintenance of the software (with or without reengineering) **6**

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