Please check that this question paper contains 09 questions and 02 printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. 2203751

Program: B.Tech. (IT) *(Batch 2018 onwards)*
Semester: 6th
Name of Subject: Design and Analysis of Algorithm
Subject Code: PCIT-113
Paper ID: 17205
Scientific calculator is Allowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice.
3) Any missing data may be assumed appropriately.

Part – A **[Marks: 02 each]**

Q. 1

a) Illustrate the concept of *CNF-satisfiability* for Conjunctive Normal Form.

b) Discuss *f(n)* and ε-approximate algorithms.

c) Define the principle of optimality.

d) Describe the explicit and implicit constraints of a problem.

e) Test the efficiency of the following code snippet in terms of Big Oh notation:-

```
for (i=0;  i < n;  i++)
 {
    for (j=0;  j< i; j++)
        {  statement;  }
 }
```

f) Formulate the θ – notation of $f(n) = 4n^2 + 2n + 1$

Part – B [Marks: 04 each]

Q. 2 Illustrate the performance of Quicksort algorithm for its average and worst cases.

Q. 3 Demonstrate the working of a backtracking algorithm which can find all the Hamiltonian cycles in a graph.

Q. 4 Explain how Rabin-Karp algorithm works for pattern matching application.

Q. 5 Design a greedy-algorithmic approach in order to earn *maximum profit* for the following fractional Knapsack instance:-

Number of elements = $n = 4$
Maximum Capacity of Knapsack = $m = 15$
Profits = $(p_1, p_2, p_3, p_4) = (10, 16, 20, 18)$
Weights = $(w_1, w_2, w_3, w_4) = (5, 2, 4, 6)$

Q. 6 Appraise the importance of using greedy method and relaxing the condition of $x_i = 0$ or 1 to $0 \leq x_i \leq 1$ while computing optimal solution for 0/1 Knapsack problem using a recursive backtracking algorithm.

Q. 7 Develop a dynamic-programming approach to solve all-pairs shortest paths problem.

Part – C [Marks: 12 each]

Q. 8 Explain the working and performance of Prim's and Kruskal's algorithms to compute minimum cost spanning tree.

OR

Demonstrate that Bellman and Ford algorithm is superior than Dijkstra's Algorithm.

Q. 9 Examine how Boyer-Moore algorithm works efficiently than Boyer-Moore Horspool algorithm for the worst case time complexity.

OR

Judge the correctness of the statement that all NP-complete problems are NP-hard and are decision problems but there are some NP-hard decision problems which can never become NP-complete.

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$x_1 =$
$30 + 95 + \frac{2 \times 10}{8} 2$
$75 +$

Please check that this question paper contains *09* questions and *02* printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 02]

Uni. Roll No. 2018278

Program: B.Tech. (Batch 2018 onward)
Semester: 6th
Name of Subject: Introduction to Machine Learning.
Subject Code: PCIT-114
Paper ID: 17206.

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) What is the difference between traditional programming and machine learning?

b) What is overfitting and underfitting in machine learning?

c) Differentiate between supervised and unsupervised learning with example.

d) Name two common performance metrics used to evaluate machine learning models.

e) Elaborate with a suitable example how Decision Tree performs classification.

f) A weather app uses fuzzy logic to recommend whether a user should carry an umbrella. Suggest inputs and outline how fuzzy logic can support this decision-making.

Part – B **[Marks: 04 each]**

Q2. What is the role of a dataset in the machine learning process? Why is data preprocessing important in machine learning?

Q3. Differentiate between AGNES and DIANA clustering techniques.

Q4. In the context of machine learning, explain the difference between a feature and a label in a dataset. Additionally, describe the role of training data and the importance of using a separate test set during model evaluation.

Q5. A financial company wants to categorize clients into high, medium, or low risk. How can Gaussian Mixture Models be used in this scenario?

Q6. An e-commerce site wants to classify product reviews as Positive, Negative, or Neutral. Suggest a suitable classification algorithm and justify your choice.

Q7. Explain how Self-Organizing Maps can help visualize high-dimensional customer data for segmentation.

Part – C **[Marks: 12 each]**

Q8. An online learning platform wants to predict student performance based on study hours, quiz scores, and attendance. How different regression techniques can be applied. Support your answer with diagrams and suitable use cases.

OR

A shopping website wants to group customers based on their browsing and purchase behavior to offer personalized deals. Which clustering methods can be used, and why? Explain with suitable examples.

Q9. A university wants to auto-classify student queries into categories like Admission, Examination, Hostel, Placement, and General. As an ML expert, suggest suitable classification models (K-NN, Naive Bayes, SVM, Random Forest) for this task. Compare them based on accuracy, interpretability, training time, and text data suitability.

OR

Design a fuzzy logic system to evaluate student performance based on attendance, assignment scores, and test results. Define input variables, membership functions, rules, and defuzzification strategy.

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Please check that this question paper contains 09 questions and 03 printed pages within first ten minutes

[Total No. of Questions: 09]
Uni. Roll No. 2203751

[Total No. of Pages: 03]

Program: B.Tech. (Batch 2018 onward)
Semester: 6th
Name of Subject: Project Management and Monitoring
Subject Code: OECE-103
Paper ID: 17154
Scientific calculator is Allowed

Time Allowed: 03 Hours

Max. Marks: 60

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A

[Marks: 02 each]

Q1.

a) Explain the difference between PERT and CPM
b) Outline the concept of various types of time estimates in PERT
c) Summarize the terms: ACTIVITY and EVENT ; explaining its importance in project management
d) Discuss the shortcomings of Bar Chart
e) Categorize the various rules for provision of Dummies in a network
f) Illustrate the various types of floats used in CPM

Part – B

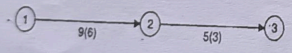
[Marks: 04 each]

Q2. What is the meaning of *'Probability distribution curve'*? Discuss the difference between normal probability distribution and beta distribution

Q3. Discuss the classification of various types of activities on the basis of *'degree of float'* .What is the significance of these activities in CPM network analysis?

Q4. Explain; why planning in project management is necessary? Enlist also; the various steps for planning a project

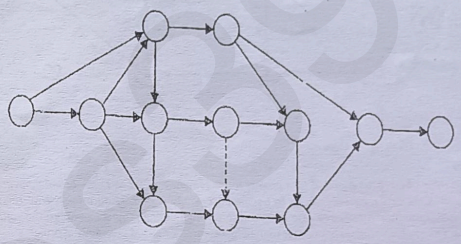
Q5. Table gives the information about various activities of network shown in fig.



Activity	Normal Duration(Days)	Normal Cost(Rs.)	Crash Duration(Days)	Crash Cost(Rs.)
1-2	9	8000	6	9500
2-3	5	5000	3	5500

The Project overhead costs are @ Rs.300/- per day. Determine the minimum cost at optimum time duration for the project

Q6. Number the events for the following Network using D.R. Fulkerson's rule



Q7. A project consists of SIX (6) activities designated from A to F, with the following relationships:
(1) A is the first job to be performed
(2) B and C can be conducted concurrently, and must follow A
(3) B must precede D
(4) E must succeed C, but it cannot start until B is completed
(5) The last operation F is dependent on the completion of both D and E
Draw the Network Diagram

Part – C

[Marks: 12 each]

Q8. Enumerate the term: **'UPDATING A PROJECT'**. Why is it necessary? Discuss; when updating should be performed & what methods can be adopted for updating the project

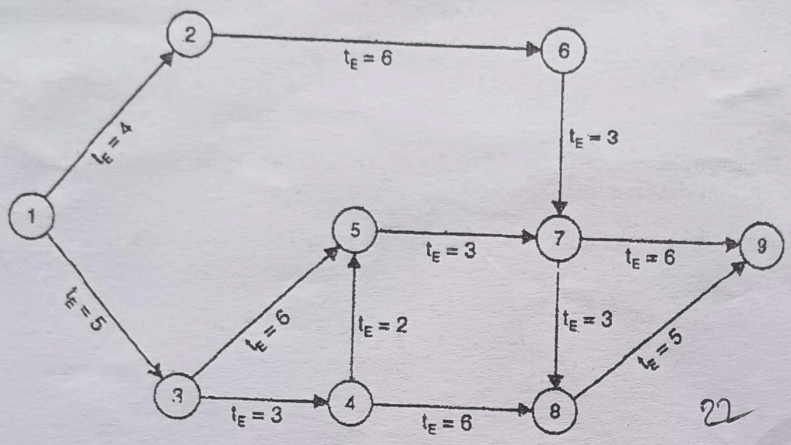
OR

Discuss in detail with suitable examples; the various methods by which a Critical Path can be determined in project management and monitoring for both PERT & CPM network analysis

P.T.O.

P.T.O.

Q9. The expected time of completion (in days) for each activity of a PERT Network is shown in figure. Determine the ***'critical path'***. It is given that scheduled completion time is 21 days



OR

"PERT is often recommended as a project management tool for research-based innovative engineering projects due to its ability to handle uncertainty in activity duration." With reference to this statement; critically evaluate by taking some engineering project examples; the suitability of the PERT networking technique for managing research-oriented engineering projects

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Please check that this question paper contains 9 questions and 2 printed pages within first ten minutes.

[Total No. of Questions: 09]
Uni. Roll No. .....

[Total No. of Pages: 2]

Program: B.Tech. (Batch 2018 onward)
Semester: 6
Name of Subject: Mean Full Stack Web Development
Subject Code: PEIT-109
Paper ID: 17209

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Define the term *full-stack development* and identify one of its key advantages.
b) List the components of the MEAN stack used in web application development.
c) Name any two features of Express.js.
d) State the use of Node Package Manager (NPM) in a Node.js environment.
e) Compare the roles of horizontal and vertical folder structure in Express applications.
f) Categorize types of files rendered statically in an Express web app and justify their use.

Part – B **[Marks: 04 each]**

Q2. Identify the purpose of JavaScript closures in Node.js programming.
Q3. Illustrate the use of the MVC pattern in developing Node.js applications.
Q4. Describe the process of installing MongoDB and list two of its key features.
Q5. Differentiate between AngularJS modules and components using suitable examples.
Q6. Analyze the two-way data binding concept in AngularJS.
Q7. Evaluate the use of Mongoose in defining MongoDB schemas.

Part – C

[Marks: 12 each]

Q8. Design a Node.js and Express-based web application to display product listings. Use appropriate tokens such as keywords, identifiers, constants, and operators in your implementation. Also, explain the importance of operator precedence and associativity with examples.

OR

Develop a code snippet in which static files like CSS and images are served using Express. Identify punctuation symbols used and state their function in the code.

Q9. Construct a REST API using Express that performs create, read, update, and delete (CRUD) operations on MongoDB. Integrate this API with an Angular frontend and demonstrate a complete data flow using Angular components.

OR

Create an Angular application using TypeScript that uses routing, component-based structure, and modular design. Assess how form handling and data submission improve performance in single-page applications.

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Please check that this question paper contains __09_ questions and _02_ printed pages within first ten minutes.

[Total No. of Questions: 09] [Total No. of Pages: 2]

Uni. Roll No. .....

Program: B.Tech. (Batch 2018 onward)
Semester: 6th
Name of Subject: DevOps: Software Architecture

Subject Code: PCIT-115

Paper ID: 17207

Scientific calculator is NotAllowed

Time Allowed: 03 Hours **Max. Marks: 60**

NOTE:

1) Parts A and B are compulsory
2) Part-C has Two Questions Q8 and Q9. Both are compulsory, but with internal choice
3) Any missing data may be assumed appropriately

Part – A **[Marks: 02 each]**

Q1.

a) Explain the role of Continuous Integration in DevOps.
b) How would you create a new branch in GIT?
c) List any two features of Jenkins.
d) Illustrate the concept of contanerization.
e) Diffenrentiate between pulling and pushing in GIT.
f) Explain the role of version control system.

Part – B **[Marks: 04 each]**

Q2. Describe the Docker architecture with a neat diagram.
Q3. Explain the process of creating and merging branches in Git.
Q4. Describe the steps to configure a basic Jenkins pipeline.
Q5. Evaluate the benefits and limitations of linking Jenkins with Docker container deployment.

Q6. Illustrate the concept of various devops tools in detail and also mention their primary functions.

Q7. Explain with an example how Docker Compose is used to run multiple containers.

Part – C **[Marks: 12 each]**

Q8. Explain in detail the complete process of creating a Docker image, tagging it, and uploading it to Docker Hub. Also, mention how the image can be pulled and used on another system.

OR

Explain the concept of Docker Compose. Describe with an example how Docker Compose is used to create and run multiple containers simultaneously for a multi-tier application.

Q9. Design a Git workflow that includes all the steps for creating a new repository, creating and switching branches, adding and committing changes, creating branches, committing changes, and merging branches into the main branch.

OR

Explain how the integration of Git, Jenkins, and Docker helps in achieving DevOps automation. Describe each tool's role and how they work together in an enterprise application deployment pipeline.

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