



**VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE**  
[Central Technological Institute, Maharashtra State]  
**Matunga, Mumbai-400 019**

SEMESTER EXAMINATION *ESE-MTech* DATE OF EXAM : 17/03/2023  
SEMESTER & PROGRAM *1 sem, M.Tech(Comp Engg)* TIME : 10am-1:00pm  
TIME ALLOWED *3 Hrs* MARKS : 100  
COURSE (CourseCode) : *CLOUD COMPUTING (COCE5012S)*

- Instructions
1. All questions carry equal marks.
  2. Figures to the right indicate full marks.

- Q1 1 What is the role of cloud file system in cloud computing. Explain Google file system. 10
- 2 Explain Google cloud platform as case study of cloud computing 10
- Q2 1 Explain AWS architecture as cloud platform to offer services 10
- 2 Explain Hadoop's system rack architecture for execution and distribution of jobs. Map the Map-Reduce architecture to Hadoop System architecture. 10
- Q3 1 What is the role of Key-Value pairs ? How it contribute to perform large volume of data in lesser computing time ? 10
- 2 What is the cloud architecture for elasticity ? 10
- Q4 1 Explain the scenarios where IaaS makes sense and scenarios where IaaS may not be the best option in cloud service model 7
- 2 What are the considerations for SLA in cloud service usage ? 6
- 3 What are the steps towards Energy Efficiency to enforce green computing? Explain the Power aware scheduling algorithm with suitable example. 7
- Q5 1 What are the capabilities of Openstack ? Explain the open stack architecture and workflow. 7
- 2 Describe Fog Computing, and Edge Computing 6
- 3 Explain the Geospatial Cloud as use case of cloud computing 7

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EXAMINATION	ESE - March 2023	DATE OF EXAM	15-03-2023
SEMESTER & PROGRAM	Sem-I, First Year MTech Computer Engineering	TIME	10:00 am to 01:00 pm
TIME ALLOWED	3.0 Hrs.	MARKS	100
COURSE NAME - (CODE)	Advanced Algorithms (CCE5011T)		

- Instructions
1. All questions are compulsory and figures to the right indicate full marks.
  2. Assume and mention necessary data wherever required.
  3. Draw diagrams wherever necessary.
  4. Write answers to each main question on a separate page.
  5. Do not write anything on the question paper.

Q.1 (a)	Using the master method, solve the following recurrences:  i) $T(n) = 9T(n/3) + n$ ii) $T(n) = 2T(n/2) + \Theta(n)$ iii) $T(n) = 3T(n/4) + n \log n$ iv) $T(n) = 8T(n/2) + \Theta(n^2)$ v) $T(n) = T(2n/3) + 1$	(10M) [CO1]
(b)	1. Define amortized analysis. Explain accounting method with an example.	(05 M) [CO1]
	2. Explain the following asymptotic notations: $O, \Omega, \Theta$ with suitable examples.	(05 M) [CO1]
Q.2 (a)	Determine how to randomize the deterministic algorithm considering the following problem:	(10M) [CO1]

	i) Linear search algorithm ii) Quick sort algorithm	
(b)	1. Define Dynamic Programming. Give general steps involved in Dynamic programming.	(05M) [CO1]
	2. Write an algorithm for 1/0 knapsack problem.	(05M) [CO1]
Q.3 (a)	1. Give bi-connected components of the following figure and explain complexity. <div style="text-align: center;"> </div>	(10M) [CO1]
(b)	Write and explain all pair shortest path algorithm with example.	(10M) [CO1]
Q.4 (a)	The ABC organization needs a way to monitor different locations through robots using cameras. With the given set of points, how Graham's scan algorithm selects a set of nodes for obstacle-free robot movement to cover the complete area?	(10M) [CO1]

	<p>Give the final path coordinates and trajectory for robot movement.</p>	
(b)	Introduce NP completeness and What are NP, P, NP-complete, and NP-Hard problems? What is Reduction?	(10M) [CO1]
Q.5 (a)	Describe proof of NP-hardness and NP-completeness	(05M) [CO1]
(b)	Explain vertex cover problem in detail with example.	(05M) [CO1]
	State and prove that travelling salesman problem is NP class problem.	(10M) [CO1]





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EXAMINATION	ESE- Odd Semester 2022-23	DATE OF EXAM	06/03/2023
SEMESTER & PROGRAM	I Semester M. Tech (CS/PS/IOT/ETC/COMP)	TIME	10.00 AM - 01.00 PM
TIME ALLOWED	180 mins	MARKS	100
COURSE (Course Code)	Artificial Neural Networks and Machine Learning (EECSS5061S/EEPS5061S/EEIT5061S/EEET5061S)		

**Instructions:** (1) All questions are Compulsory  
(2) Assume data if necessary.

Q. No	Question	Marks	CO
Q.1	(a) Compare Biological neural network with Artificial Neural Network	(5)	CO1
	(b) Write and draw different network topologies.	(5)	CO1
	(c) Specify difference between Batch Gradient descent and stochastic Gradient Descent.	(5)	CO1
	(d) What are Bayesian Belief Networks?	(5)	CO2
Q.2	(a) Draw flow chart of training algorithm for learning Vector Quantization.	(6)	CO2
	(b) Explain ART1 Architecture in detail.	(6)	CO1
	(c) Describe Expectation maximization algorithm in detail with the help of flow chart.	(8)	CO1
Q.3	(a) What is Genetic Algorithm? Discuss its Advantages and limitations.	(6)	CO2
	(b) Explain Hamming networks .	(4)	CO2
	(c) Write Algorithm for Kohonen's self organizing Features map.	(6)	CO1
	(d) Write Bayes theorem and Explain with an Example.	(4)	CO2
Q.4	(a) Explain Training algorithm for Boltzmann Machine	(6)	CO1
	(b) What is simulated Annealing? How is it being used in ANN ?	(6)	CO1
	(c) Explain algorithm for simulated annealing		
	Write a short note on support vector machine (SVM)	(8)	CO2
	1. Definition of SVM {2 marks}		
	2. Example of SVM {2 marks}		
	3. Types of SVM {2 marks}		

[P.T.O.]

4. Hyperplane and support vector algorithm in SVM {2 marks}

- Q.5 (a) Write a short note on Application of ANN for {Choose any 3} (12) CO1  
{Each contain 4 Marks}
- (i) Function Approximation
  - (ii) Pattern Recognition
  - (iii) Clustering
  - (iv) Vector Quantization
- (b) Discuss below parameters for Evaluation of classification model (4) CO1
- 1. Confusion matrix
  - 2. AUC-ROC curves
- (c) Discuss implementation of Radial Basis function for solving XOR Problem. (4) CO1

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# VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

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EXAMINATION	End Semester Examination (ESE) March 2023	DATE OF EXAM	08/03/2023
SEMESTER & PROGRAM	Sem-I, First Year M Tech (Computer Engineering)	TIME	10.00am to 1.00pm
TIME ALLOWED	3 HR.	MARKS	100
COURSE NAME – (CODE)	Computer System Performance Analysis(COCE5023T)		

- Instructions
1. All questions carry equal marks.
  2. Figures to the right indicate full marks.

- Q.1 a What distributions would you use to model the following: (04)(CO3)
1. Number of requests between typing errors, given that each request has a certain probability of being in error.
  2. Time between successive arrivals, given that the arrivals are memoryless.
  3. The stream resulting from a merger of two Poisson streams.
  4. Sample variances from a normal population.
- b The execution times of queries on a database is normally distributed with a mean of 5 seconds and a standard deviation of 1 second. (08)(CO3)
- a. What is the probability of the execution time being more than 8 seconds?
  - b. What is the probability of the execution time being less than 6 seconds?
  - c. What percentage of responses will take between 4 and 7 seconds?
  - d. What is the 95-percentile execution time?
- c Suppose that an airplane engine will fail, when in flight, with probability  $1-p$  independently from engine to engine, suppose that the airplane will make a successful flight if at least 50 percent of its engine remain operative. For what values of  $p$  is a four engine plane preferable to a two engine plane? (08)(CO3)
- Q.2 a In a timesharing system, accounting log data produced the following profile for user programs. Each program requires five seconds of CPU time, makes 80 I/O requests to the disk A and 100 I/O requests to disk B. Average think-time of the users was 18 seconds. From the device specifications, it was determined that disk A takes 50 milliseconds to satisfy an I/O request and the disk B takes 30 milliseconds per request. With 17 active terminals, disk A throughput was observed to be 15.70 I/O requests per second. Find the system throughput and device utilizations. (10)(CO4,5)
- b List out and briefly discuss the systematic approach to performance evaluation. (08)(CO1)
- c During a 10-second observation period, 400 packets were serviced by a gateway whose CPU can service 200 pps. What was the utilization of the gateway CPU... (02)(CO4)
- Q.3 a The average response time on a database system is 3 seconds. During a 1-minute observation interval, the idle time on the system was measured to be 10 seconds. Using an M/M/1 model for the system, determine the following: (10)(CO5)
- i. System utilization  $\rho$
  - ii. Average service time per query
  - iii. Number of queries completed during the observation interval
  - iv. Average number of jobs in the system  $E[n]$
  - v. Probability of number of jobs in the system being greater than 10.
- b What are the techniques for workload characterization? Explain them in brief. (10)(CO2)

[P.T.O.]

- TECHNOLOGICAL
- Q.4 a On a network gateway, measurements show that the packets arrive at a mean rate of 125 packets per second (pps) and the gateway takes about 2 milliseconds to forward them. Using an M/M/1 model, analyze the gateway. What is the probability of buffer overflow if the gateway had only 13 buffers? How many buffers do we need to keep packet loss below one packet per million? (10)(CO5,6)
- b List out the services, factors, metrics and workloads for the analysis of an off-line backup storage system using magnetic tape drives. (10)(CO2)
- Q.5 a What is a Kendall Notation in Queueing theory and How should you obtain response time, queue lengths, and server utilizations for a single queue? (10)(CO5)
- b Define the terms a) Utilization Law b) Forced Flow Law c) Bottle neck device with relevant expressions. (10)(CO4)

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# VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

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EXAMINATION	End Semester Examination March 2023	DATE OF EXAM	10/3/2023
SEMESTER & PROGRAM	Sem-I, First Year M. Tech. Computer Engineering	TIME	10:00 am to 01:00 pm
TIME ALLOWED	3 HRS.	MARKS	100
COURSE NAME – (CODE)	Software Engineering -COCE5031S		

Instructions 1. Figures to the right indicate full marks.

- Q.1 a. Illustrate design quality assurance 8 CO4  
b. Illustrate the Capability maturity model in detail. 6 CO5  
c. Justify the use of knowledge elicitation techniques in Requirement elicitation. 6 CO3
- Q.2 a. Justify different test cases in White Box Testing. 6 CO5  
b. Illustrate Cocomo81 Model in detail. 8 CO6  
c. Difference between LOC and Function Point. 6 CO6
- Q.3 a. Draw Deployment Diagram for Library Management System 6 CO1  
b. List advantages of SQA and disadvantages of SQA 6 CO5  
c. Justify the importance of program quality metrics in detail. 8 CO5
- Q4. a. Assume that the size of an org organic type software product has been estimated to be 32,000 lines of source code. Assume that the average salary of software engineers be Rs. 17,000/- per month. Calculate the effort required to develop the software product and the nominal development time. 6 CO6

[P.T.O.]

6 CO6

b. Let us consider the following program:

```
main()  
{  
    int a, b, c, avg;  
    scanf("%d %d %d", &a, &b, &c);  
    avg = (a+b+c)/3;  
    printf("avg = %d", avg);  
}
```

Calculate Estimated Length, volume

8 CO5

c. Draw control flow graph using white box testing.

```
int armstrong(originalNumber)  
{  
    while (originalNumber != 0)  
    {  
        remainder = originalNumber % 10;  
        result += Math.pow(remainder, 3);  
        originalNumber /= 10;  
    }  
    if(result == number)  
        System.out.println(number + " is an Armstrong number.");  
    else  
        System.out.println(number + " is not an Armstrong number.");  
}
```

Q5. a. Compute FP from below example

8 CO6

[P.T.O.]

2

Measurement parameter	Count		Weighting Factor		
			Simple	Average	Complex
Number of user inputs	9	x	3	4	6
Number of user outputs	7	x	4	5	7
Number of user inquiries	8	x	3	4	6
Number of files	6	x	7	10	15
Number of external interfaces	7	x	5	7	10

6 CO5

Illustrate symbolic execution in detail

1. int a =  $\alpha$ , b =  $\beta$ , c =  $\gamma$ ;
2. // symbolic
3. int x = 0, y = 2, z = 0;
4. if (a) {
5. x = -3;
6. }
7. if (b < 4) {
8. if (1a && c) { y = 3; }
9. z = 6;
10. }
11. assert(x+y+z!=8)

A supermarket needs to develop the following software to encourage regular customers. For this, the customer needs to supply his/her residence address, telephone number, and the driving license number. Each customer who registers for this scheme is assigned a unique customer number (CN) by the computer. A customer can present his CN to the check out staff when he makes any purchase. In this case, the value of his purchase is credited against his CN. At the end of each year, the supermarket intends to award surprise gifts to 10 customers who make the highest total purchase over the year. Also, it intends to award a 22 caret gold coin to every customer whose purchase exceeded Rs.10,000. The entries against the CN are the reset on the day of every year after the prize winners' lists are generated. Draw DFD diagram for level 1.

6 CO1

— X —

3



# VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

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EXAMINATION	End Semester Examination march 2023	DATE OF EXAM	13/03/2023
SEMESTER & PROGRAM	Sem-I, M. Tech. Computer Engineering	TIME	10:00 AM to 1:00 PM
TIME ALLOWED	3 HRS.	MARKS	100
COURSE NAME - (CODE)	Computational Methods (COCE5001S)		
C			

- Instructions
1. All questions are compulsory.
  2. Figures to the right indicate full marks.

Q.1 a. The truth values of propositional variables A, B, and C are selected independently, with probability [CO1]

$P(A = \text{True}) = 1/2$ ,  $P(B = \text{True}) = 1/3$ ,  $P(C = \text{True}) = 1/5$

What is the probability that the following formula is true

I (A Implies B) Implies C (5)

II C Implies (A Implies B) (5)

b. In a standard 52-card deck (13 ranks and 4 suits), a hand is a 5-card subset of the set of 52 cards. Express the answer to each part as a formula using factorial, binomial, or multinomial notation. [CO4]

I Let  $H_{np}$  be the set of all hands that include no pairs; that is, no two cards in the hand have the same rank. What is  $|H_{np}|$ ? (2)

II Let  $H_s$  be the set of all hands that are straights, i.e. the ranks of the five cards are consecutive. The order of the ranks is (A, 2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A); note that A appears twice. What is  $|H_s|$ ? (2)

III Let  $H_f$  be the set of all hands that are flushes; that is, the suits of the five cards are identical. What is  $|H_f|$ ? (2)

IV Let  $H_{sf}$  be the set of all straight flush hands, that is, the hand is both a straight and a flush. What is  $|H_{sf}|$ ? (2)

V Let  $H_{nc}$  be the set of all high-card hands; that is, hands that do not include pairs, are not straights, and are not flushes. What is  $|H_{nc}|$ ? (2)

Q.2 a. Prove that  $\text{dist}(u, v) \leq \text{dist}(u, x) + \text{dist}(x, v)$  [CO6]  
(10)

for all vertices  $u, v, x$  with equality holding iff  $x$  is on a shortest path from  $u$  to  $v$ .

b. Formulas defining functions from integers to integers are listed below. For each function with justification, indicate whether it is [CO1]

B, a bijection [ $\geq 1$  out,  $= 1$  in],

S, surjection [ $\geq 1$  in], but not a bijection,

I, an injection [ $\leq 1$  in], but not a bijection,

N, neither an injection nor a surjection.

I  $a(x) ::= x^2$  (2)

II  $b(x) ::= x + 2$  (2)

III  $c(x) ::= 2x$  (2)

IV  $d(x) ::= -x$  (2)

V  $e(x) ::= \lfloor x/2 \rfloor$ , that is, the quotient of  $x$  divided by 2. (2)

Q.3 a. Solve the following [CO2]

✓ What is the value of  $\phi(2)$ ? (2)

✗ What are three non-negative integers  $k > 1$  such that  $\phi(k) = 2$ ? (3)

✗ Prove that  $\phi(k)$  is even for  $k > 2$ . (5)

b. Let R and S be transitive binary relations on the same set, A. Which of the following new relations must also be transitive? For each part, justify your answer with a brief argument if the new relation is transitive and a [CO3]

{P.T.O.}



counterexample if it is not.

- ☒ I  $R^{-1}$  is transitive (3)
- ☒ II  $R \circ S$  is transitive (2)
- ☒ III  $R \circ R$  is transitive (3)
- ☒ IV  $R \circ S$  is not transitive (2)

Q.4 a. Let  $f: \mathbb{R}^+ \rightarrow \mathbb{R}^+$  be a weakly decreasing function. Defined as [CO3]  
(10)

$$S := \sum_{i=1}^n f(i)$$

and

$$I := \int_1^n f(x) dx$$

Prove that

$$I + f(n) \leq S \leq I + f(1)$$

- b. Sammy the Shark is a financial service provider who offers loans on the following terms. Sammy loans a client  $m$  dollars in the morning. This puts the client  $m$  dollars in debt to Sammy. Each evening, Sammy first charges a service fee which increases the client's debt by  $f$  dollars, and then Sammy charges interest, which multiplies the debt by a factor of  $p$ . For example, Sammy might charge a "modest" ten cent service fee and 1% interest rate per day, and then  $f$  would be 0.1 and  $p$  would be 1.01. [CO3]
- I What is the client's debt at the end of the first day? (2)
  - II What is the client's debt at the end of the second day? (2)
  - III Write a formula for the client's debt after  $d$  days and find an equivalent closed form. (3)
  - IV If you borrowed \$10 from Sammy for a year, how much would you owe him? (3)

Q.5 a. Find  $x$  and  $y$  using Euclidean algorithm for [CO2]  
 $1819x + 3587y = 17$ . (10)

- b. The running time of an algorithm  $A$  is described by the recurrence  $T(n) = 7T(n/2) + n^2$ . A competing algorithm  $A'$  has a running time of  $T'(n) = aT'(n/4) + n^2$ . For what values of  $a$  is  $A'$  asymptotically faster than  $A$ ? [CO5]  
(10)

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## Assignments

1	What is the role of cloud file system in cloud computing. Explain Google file system.
2	Explain Google cloud platform as case study of cloud computing
3	Explain AWS architecture as cloud platform to offer services
4	Explain Hadoop's system rack architecture for execution and distribution of jobs. Map the Map-Reduce architecture to Hadoop System architecture.
5	What are different components Hadoop ecosystem has? Explore HDFS in details
6	What is the role of Key-Value pairs ? How it contribute to perform large volume of data in lesser computing time ?
7	What are the common properties of distributed system ?
8	What are the essential properties and common characteristics of cloud system
9	What are the major 5 applications that are driving cloud adoptions
10	What is the cloud architecture for elasticity ?
11	Explain XaaS service architecture of cloud computing system.
12	Explain the scenarios where IaaS makes sense and scenarios where IaaS may not be the best option in cloud service model
13	Describe the logical view of IaaS cloud structure and operation.
14	Explain para-virtualization, full-virtualization and hardware assisted virtualization, and its suitability in application domain.
15	What are the design goals for Network Virtualization model ?
16	What are the considerations for SLA in cloud service usage ?
17	What are the metrics for monitoring and auditing of cloud service assured in SLA
18	What is Service Level Management? What are the considerations for SLA
19	Illustrate the map-reduce workflow for Word Count in pdf copy of book. Explain the components of workflow
20	Explain image processing for Image Search on cloud using map-reduce model

21	What are the capabilities of Openstack ? Explain the open stack architecture and workflow.
22	Describe storage service model of the OpenStack.
25	What are the basic requirements to provide security to the system? Explain the security attacks types.
26	Explain the security policy lines to be plan for providing system security
27	What are the security issue causes and its solutions?
28	What are the application scenarios for virtualization?
29	What are the possible vulnerabilities in the virtual environment ?
30	What are the peculiar good practices to secure containers of the virtual system.
31	Explain the Cloud Reference Model. What are the benefits of cloud computing?
32	Describe Fog Computing, and Edge Computing
33	What are the steps towards Energy Efficiency to enforce green computing? Explain the Power aware scheduling algorithm with suitable example.
34	Explain the Geospatial Cloud as use case of cloud computing