DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103
Winter Semester Examination – Nov - 2019

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Branch: Computer Science & Engineering **Sem.:- IV**

Subject:- Design and Analysis of Algorithms (BTCOC401) **Marks: 60**

Date:- 26/11/2019 **Time:- 3 Hrs.**

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Instructions to the Students
1. Each Question carries 12 marks.
2. Attempt **any Five** Questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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Q.1)a)Solve the following recurrence relation using master method.
   (i) $T(n) = 4T(n/2) + n$
   (ii) $T(n) = 4T(n/2) + n^2$
   (iii)$T(n) = 4T(n/2) + n^3$

Q.1)b) Explain different asymptotic notations.

Q.2)a)Write Strassen's algorithm to multiply two 2X2 matrices. Apply Strassen's algorithm to multiply following matrices.
$$A= \begin{Bmatrix} 1 & 1 \\ 1 & 1 \end{Bmatrix} \quad B = \begin{Bmatrix} 2 & 2 \\ 2 & 2 \end{Bmatrix}$$

Q.2) b) Write an algorithm for merge sort . Apply merge sort on following array
   A= 5 1 2 6 3 7 9 4

Q.3) a) Write Huffman Coding algorithm . Obtain Huffman tree for following data.

Characters	"a"	"b"	"c"	"d"	"e"
Frequency	6	11	19	35	50

Q.3) b) What are the different elements of greedy strategy ? Explain the steps to solve the problem by greedy strategy.

Q.4) a) Compute Longest Common Subsequence using Dynamic Programming approach for sequences X and Y if X =A, B, C, B, D, A, B and Y =· B, D, C, A, B, A . What is the

length of LCS .
b) Compare Greedy Strategy , Dynamic Programming and Divide and Conquer approach.

Q.5)a) What is state space tree ?Using state space tree show that there exist an solution to
4-Queens problem .

b) Given n=6 weights, w={5,10,12,13,15,18} and M=30 .Find all possible subsets for
which sum=M using sum of subsets algorithm.

Q.6) a) What is P class and NP class? Show relationship between them.

b) State the properties of Red- Black tree. Suppose that a node x is inserted into a
red-black tree with RB-INSERT and then immediately deleted with RB-D ELETE .
Is the resulting red-black tree the same as the initial red-black tree? Justify your answer.

************Paper End**********

B.Tech. in Computer Engineering   **Semester: IV**
Subject: Probability and Statistics[BTCOC402]   **Marks: 60**
Date:28/11/2019   **Time: 3 Hr.**

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Instructions to the Students:
1. Each question carries 12 marks.
2. Attempt any **FIVE** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

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                                                    Marks

Que. 1   **Attempt any TWO of the following.**   **[12]**

   A)   A committee of 12 is to be formed from 9 women and 8 men. In how many ways this can be done if at least five women have to be included in a committee? In how many of these committees.
(a) The women are in majority?
(b) The men are in majority?

   B)   How many arrangements of the letters of the word 'BENGALI' can be made
(i) if the vowels are never together
(ii) if the vowels are to occupy only odd places

   C)   In bolt factory, machines A, B and C manufacture respectively 25%, 35% and 40% of the total. Of their output 5, 4, 2 percent are known to be defective bolts. A bolt is drawn at random from the product and is found to be defective. What is the probabilities that it was manufactured by
(i) machine A
(ii) machine B or C

Que. 2   **Attempt the following questions.**   **[12]**

   A)

Let X be a discrete random variable with the following PMF

$$PX(k) = \begin{cases} 0.1 & \text{for } k=0 \\ 0.4 & \text{for } k=1 \\ 0.3 & \text{for } k=2 \\ 0.2 & \text{for } k=3 \\ 0 & \text{otherwise} \end{cases}$$

(a) Find E(X).
(b) Find var(X).
(c) If $Y = (X-2)^2$, find E(Y).

                                                                  1

B) The random variable X has a range of {0, 1, 2} and the random variable Y has a range of {1, 2}. The joint distribution of X and Y is given by the following table:

x	y	P(X=x, Y=y)
0	1	0.2
0	2	0.1
1	1	0.0
1	2	0.2
2	1	0.3
2	2	0.2

(i) Write down tables for the marginal distributions of X and of Y
(ii) Write down a table for the conditional distribution of X given that Y= 2
(iii) Compute E(X) and E(Y)

Que. 3   Attempt any TWO of the following questions.   **[12]**

A) A (blindfolded) marksman finds that on the average he hits the target 4 times out of 5. If he fires 4 shots, what is the probability of
(i) more than 2 hits?
(ii) at least 3 misses?

B) Vehicles pass through a junction on a busy road at an average rate of 300 per hour.
   i.   Find the probability that none passes in a given minute.
   ii. What is the expected number passing in two minutes?
   iii. Find the probability that this expected number actually pass through in a given two-minute period.

C) Time taken by the crew, of a company, to construct a small bridge is a normal variate with mean 400 labour hours and standard deviation of 100 labour hours.
   i.) What is the probability that bridge gets constructed between 350 to 450 labour hours?
   ii.) If company promises to construct the bridge in 450 labour hours or less and agrees to pay penalty of Rs. 100 for each labour hour spent in excess of 450, what is the probability that a company pays a penalty of at least Rs. 2000?

Que. 4   Attempt the following questions.   **[12]**

A) Calculate a Spearman rank-order correlation on data without any ties we will use the following data:

Marks

| English | 56 | 75 | 45 | 71 | 62 | 64 | 58 | 80 | 76 | 61 |
| Maths | 66 | 70 | 40 | 60 | 65 | 56 | 59 | 77 | 67 | 63 |

B) The table below shows the number of absences x, in a Calculus course and the final exam grade y, for 7 students. Find the correlation coefficient and interpret your result.

x	1	0	2	6	4	3	3
y	95	90	90	55	70	80	85

2

Que. 5   Attempt the following questions.   **[12]**

A)   The values of y and their corresponding values of y are shown in the table below

x	0	1	2	3	4
y	2	3	5	4	6

a) Find the least square regression line $y = ax + b$.

b) Estimate the value of y when $x = 10$.

B)   The data about the sales and advertisement expenditure of a firm is given below:

	Sales	Advertisement Expenditure
Mean	40	6
Standard Deviation	10	1.5

Coefficient of correlation, r = 0.9

(i) Estimate the likely sales for a proposed advertisement expenditure of Rs. 10 Cr.

(ii) What should be the advertisement expenditure if the firm proposes a sales target of 60 crores of rupees?

Que. 6   Solve the following.   **[12]**

A)   A full-time PhD students received an average salary of $12,837 according to U.S. Department of Education. The dean of graduate studies at a large state University feels that PhD. Students in his state earn more than this. He surveys 44 randomly selected students and finds their average salary is $14,445 with a standard deviation of $150. With a $\alpha = 0.05$, is the dean correct?

B)   i.)   We have a medicine that is being manufactured and each pill is supposed to have 14 milligrams of the active ingredient. What are our null and alternative hypotheses?

ii.)   The school principal wants to test if it is true what teachers say – that high school juniors use the computer an average3.2 hours a day. What are our null and alternative hypotheses?

iii.)   If the difference between the hypothesized population mean and the mean of the sample is large, we _____ the null hypothesis. If the difference between the hypothesized population mean and the mean of the sample is small, we _____ the null hypothesis.

####Paper End####

3

Areas Under the One-Tailed Standard Normal Curve

This table provides the area between the mean and some Z score. For example, when Z score = 1.45 the area = 0.4265.

σ = 1

0.4265

Z   μ=0   1.45
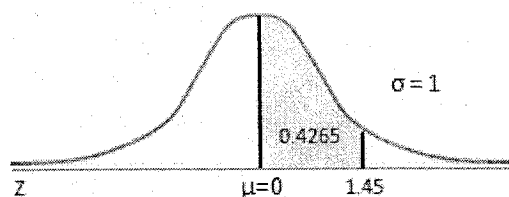
Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

B. Tech Winter Semester Supplementary Examination: Nov.-2019

Branch: B.Tech. (Computer Engineering)

Subject with Subject Code: Operating System[BTCOC403]

Date:- 30/11/2019

Sem: IV

Marks:60

Time: 3 Hrs

Instructions to the Students:
1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

Marks

Q.1 Attempt the following questions.

06

(A) Define operating system. Enlist and explain different types of os.

06

(B) List five services provided by an operating system, and explain how each creates convenience for users. In which cases would it be impossible for user-level programs to provide these services? Explain your answer.

Q. 2 Attempt the following questions.

(A) Describe the actions taken by a kernel to context-switch between processes.   06

(B) Using the given information about the processes, calculate Average Waiting Time and   06
Average Turnaround Time of each process under following scheduling algorithms:
a) First Come First Served
b) Shortest Job First
c) Round Robin (With time slice of 5 ms)

Process	Burst time(ms)
P1	5
P2	24
P3	16
P4	10
P5	3

Q.3 Solve any Two.

(A) What is Inter-process communication?Are function callback and inter-process communication   06
same?

(B) Explain why interrupts are not appropriate for implementing synchronization primitives in multiprocessor systems.   06

(C) What are the requirements for the solution to critical section problem?   06

Q.4   **Attempt the following questions.**

(A) Consider the deadlock situation that could occur in the dining-philosophers problem when the philosophers obtain the chopsticks one at a time. Discuss how the four necessary conditions for deadlock indeed hold in this setting. Discuss how deadlocks could be avoided by eliminating any one of the four conditions.   06

(B) What are the Conditions for Deadlock to occur? Briefly explain. In a system, the following state of processes and resources are given: R1→ P1, P1→ R2, P2→ R3, R2→ P2, R3→ P3, P3→ R4, P4→ R3, R4→ P4, P4→ R1, R1→ P5. Draw Resource Allocation Graph for the system and check for deadlock condition. Explain your answer.   06

Q.5   **Attempt the following questions.**

(A) Given five memory partitions of 100 KB, 500 KB, 200 KB, 300 KB, and 600 KB (ill order), how would the first-fit, best-fit, and worst-fit algorithms place processes of 212 KB, 417 KB, 112 KB, and 426 KB (in order)? Which algorithm makes the most efficient use of memory?   06

(B) Compare the memory organization schemes of contiguous memory allocation, pure segmentation, and pure paging with respect to the following issues: 06
a. External fragmentation
b. Internal fragmentation
c. Ability to share code across processes

Q.6   **Attempt the following questions.**

(A) Consider a reference string: 4, 7, 6, 1, 7, 6, 1, 2, 7, 2. the number of frames in the memory is 3. Find out the number of page faults respective to: 06
    1. Optimal Page Replacement Algorithm
    2. FIFO Page Replacement Algorithm
    3. LRU Page Replacement Algorithm

(B) In what situations would using memory as a RAM disk be more useful than using it as a disk cache?   06

*********************End of Paper*********************

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY,
LONERE – RAIGAD - 402 103
Supplementary Examination Winter Dec-2019

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Branch: B. Tech. In Computer Engineering   **Sem.:- IV**
Subject: Object Oriented Programming in Java (BTCOE404A)   **Marks: 60**
Date: 02/ 11 /2019   **Time: 3 Hours.**

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Instructions to the Students
1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly   .

Q. No		(Marks)
Q.1.A]	How Java differs from C and C++?	(6M)
Q.1.B]	Explain the general structure of the Java Program.	(6M)
Q.2.A]	What is readLine( ). Write a simple Java Program which reads an integer, character and float value from the keyboard.	(6M)
Q.2.B]	What is a class? What is an object? How does class is declared? How instance of a class is generated?	(6M)
Q.3.A]	What are switch statements? Write a simple Java Program which performs Arithmetic Operations using switch statement.	(6M)
Q.3.B]	Explain: a) Conditional operators. b) Logical Operators. c) Bitwise Operators.	(6M)
Q.4.A]	How arrays are declared and created in computer memory? Write a simple Java program performing [2 X 2] matrix addition.	(6M)
Q.4.B]	Write a Java Program to perform [3 X 3] Matrix Multiplication.	(6M)
Q.5.A]	What are constructors? What are methods? How methods are declared in Java.	(6M)
Q.5.B]	Explain the Get and Set Methods using a Java Program.	(6M)
Q.6.A]	Explain the different types of inheritance implemented in Java.	(6M)
Q.6.B]	Write a short note on: a) Polymorphism. b) Strings. c) Packages.	(6M)

*********************END OF QUESTION PAPER*********************

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End Semester Examination – Winter 2019

Course: B. Tech in
Sem: III

Subject Name: Engineering Mathematics-III (BTBSC301)
Marks: 60

Date: 10/12/2019
Duration: 3 Hr.

Instructions to the Students:
1. *Solve ANY FIVE questions out of the following.*
2. *The level question/expected answer as per OBE or the Course Outcome (CO) on which the question is based is mentioned in ( ) in front of the question.*
3. *Use of non-programmable scientific calculators is allowed.*
4. *Assume suitable data wherever necessary and mention it clearly.*

		(Level/CO)	Marks
Q. 1	**Attempt the following.**		12
A)	Find $L\left\{cosht \int_0^t e^u\, coshu\, du\right\}$.	Analysis	4
B)	If $f(t) = \begin{cases} t, & 0 < t < \pi \\ \pi - t, & \pi < t < 2\pi \end{cases}$ is a periodic function with period 2π. Find $L\{f(t)\}$.	Analysis	4
C)	Using Laplace transform evaluate $\int_0^\infty e^{-at}\, \frac{sin^2 t}{t}\, dt$	Evaluation	4
Q. 2	**Attempt any three of the following.**		12
A)	Using convolution theorem find $L^{-1}\left\{\frac{1}{s(s+1)(s+2)}\right\}$	Application	4
B)	Find $L^{-1}\{\bar{f}(s)\}$, where $\bar{f}(s) = \log\left(\frac{s^2+1}{s(s+1)}\right)$	Analysis	4
C)	Using Laplace transform solve $y'' + 2y' + 5y = e^{-t}\sin t$; $y(0) = 0$, $y'(0) = 1$	Application	4
D)	Find $L^{-1}\left\{\frac{s^2+2s-4}{(s-5)(s^2+9)}\right\}$	Analysis	4
Q. 3	**Attempt any three of the following.**		12

SX

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A)	Express the function $f(x) = \begin{cases} \sin x, & 0 \le x \le \pi \\ 0, & x > \pi \end{cases}$ as a Fourier sine integral and hence evaluate $\int_0^\infty \frac{\sin\lambda x \,\sin\lambda\pi}{1-\lambda^2}\, d\lambda$.	Evaluation	4
B)	Using Parseval's identity for cosine transform, evaluate $\int_0^\infty \frac{dx}{(x^2+a^2)(x^2+b^2)}$.	Application	4
C)	Find the Fourier sine transform of $f(x) = \begin{cases} x, & 0 \le x \le 1 \\ 2 - x, & 1 \le x \le 2 \\ 0, & x > 2 \end{cases}$.	Analysis	4
D)	If $F_S\{f(x)\} = \frac{e^{-as}}{s}$, then find $f(x)$. Hence obtain the inverse Fourier sine transform of $\frac{1}{s}$.	Analysis	4
Q. 4	**Attempt any three of the following.**		**12**
A)	Form the partial differential equation by eliminating arbitrary function f from $f(x^2 + y^2 + z^2, 3x + 5y + 7z) = 0$	Synthesis	4
B)	Solve $pz - qz = z^2 + (x + y)^2$	Application	4
C)	Determine the solution of one dimensional heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial x^2}$ where the boundary conditions are $u(0, t) = 0$, $u(l, t) = 0$ $(t > 0)$ and the initial condition $u(x, 0) = x$; l being the length of the bar.	Analysis	4
D	Use the method of separation of variables to solve the equation $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$, given that $u(x, 0) = 6e^{-3x}$	Application	4
Q. 5	**Attempt the following.**		**12**
A)	Determine the analytic function $f(z)$ in terms of z whose real part is $\frac{\sin 2x}{\cosh 2y - \cos 2x}$	Analysis	4
B)	Prove that $u = x^2 - y^2 - 2xy - 2x + 3y$ is harmonic. Find a function v such that $f(z) = u + iv$ is analytic.	Analysis	4
C)	Find the bilinear transformation which maps the points $z = 0, -1, -i$ onto the points $w = i, 0, \infty$. Also, find the image of the unit circle $|z| = 1$.	Analysis	4
Q. 6	**Attempt the following.**		**12**
A)	Use Cauchy's integral formula to evaluate $\oint_C \frac{\sin\pi z^2 + \cos\pi z^2}{(z-1)(z-2)}\, dz$, where C is the circle $|z| = 3$.	Evaluation	4
B)	Find the poles of function $\frac{z^2 - 2z}{(z+1)^2(z^2+4)}$. Also find the residue at each pole.	Analysis	4
C)	Evaluate $\oint_C \frac{e^z}{\cos\pi z}\, dz$, where C is the unit circle $|z| = 1$.	Evaluation	4

*** Paper End ***

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103
Winter Semester Examination – Dec.- 2019

Branch: Computer Science
Subject: - Discrete Mathematics (BTCOC302)
Date: - 12/12/2019

Sem.:- III
Marks: 60
Time:- 3 Hr.

Instructions to the Students
1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriate assume it
   and should mention it clearly

	(Marks)
Q.1. a) Let $A = \{ 4,5,7,8,10 \}$, $B = \{ 4,5,9\}$ and $C = \{ 1,4,6,9\}$. Then verify that, $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	**(6)**
b) Show that $(n^3 + 2n)$ is divisible by 3, for all $n \geq 1$, by method of induction.	**(6)**

Q.2. a) Find transitive closure of relation R defined on set $A = \{1, 2, 3, 4\}$ defined as:
$R = \{(1,2), (1,3), (1,4), (2,1), (2,3), (3,4), (3,2), (4,2), (4,3) \}$ **(6)**

b) Let set $A = \{1, 2, 3\}$, $B = \{a, b, c\}$ & $C = \{ x,y,z\}$.
Consider following relations R & S from A to B and B to C respectively.
$R = \{ (1,b), (2,a), (2,c) \}$ & $S = \{ (a,y), (b,x) , (c,y) , (c,z)\}$
(i) Find composition relation $R \circ S$.
(ii) Write matrices M_R, M_S & $M_{R \circ S}$ of relations R, S & $R \circ S$.
(iii) Find product of M_R, $M_S = M_P$
Compare and comment on contents of $M_{R \circ S}$ & M_P. **(6)**

Q.3. a) Define discrete numeric function.
Also state rules for product and sum of two numeric functions a and b.
Find sum of two numeric functions defined as:

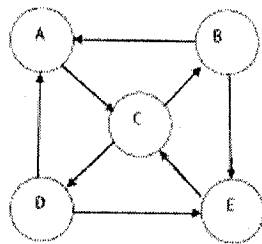$$a_r = \begin{cases} 0 & 0 \leq r \leq 2 \\ 2^{-r} + 5 & r \geq 3 \end{cases}$$

and

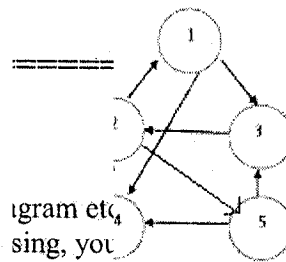$$b_r = \begin{cases} 3\text{-}2^r & 0 \leq r \leq 1 \\ r + 2 & r \geq 2 \end{cases}$$

(6)

b) (i) How many different strings of length six can be generated using either three uppercase alphabets followed by three digits or four uppercase alphabets followed by two digits.
(6)

Q.4. **a)** (i) Show that the maximum number of edges i̶ ̶ ̶ ̶ ̶e graph having n vertices is n * (n-1) / 2. **(6)**

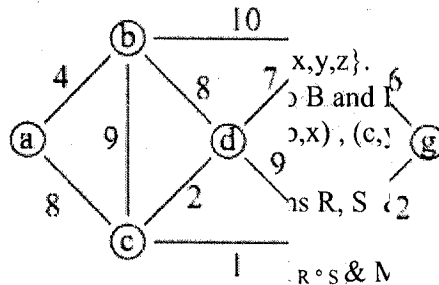**b)** (i) Show that following graphs are isomorphic̶ ̶ve correspondence between edges and vertices of two graphs. **(6)**

Q.5. **a)** Show the steps of constructing a binary Search ̶ ̶ ̶ ̶ ̶ following sequence of data items. Also write steps to search an eleme̶ { 1,4,6,̶ ̶ ̶ the resultant tree.
32, 56, 47, 28, 30, 45, 15, 72, 25 **(6)**

b) Find minimum spanning tree for the graph giv̶ ̶ ̶ ̶ ̶ ̶ using Prim's algorithm

(6)

Q.6. **a)** Define following terms
  (1) Abelian Group   (2) M̶
  (3) Ring **(6)**

b) Let A = { 0, 1, 2, 3} & <A, * > be an algebra̶ ̶,
where ∀ a,b ∈ A and a * b = (a + b) mod 4.]̶ ∈ A, a², a³, a⁴. **(6)**

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DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – December - 2019

Branch: B. Tech in Computer Engineering   Sem.:- III
Subject (Subject Code):- Data Structures (BTCOC303)   Marks: 60
Date:-14/12/2019   Time:- 3 Hrs.

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Instructions to the Students
1. Each question carries 12 marks.
2. Attempt any **FIVE** questions
3. Illustrate your answers with neat sketches, diagrams etc., wherever necessary
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly

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Q1. Solve any THREE of the following questions.   **(3x4 = 12)**

a) Why to study data structures? What are the major data structures used in the RDBMS, Network and Hierarchical data model.

b) Consider the following specification of a graph G = (V, E).
    V = {1, 2, 3, 4}
    E = {(1, 2), (1, 3), (3, 3), (3, 4), (4, 1)}
    i) Draw an undirected graph.
    ii) Represent graph G using adjacency matrix.
    iii) Represent graph G using adjacency linked list.

c) Suppose the numbers: **50, 15, 62, 5, 20, 58, 91, 3, 8, 37, 60, 24** are inserted in order into an initially empty binary search tree. What is preorder, inorder and postorder traversal sequence of the tree?

d) What is garbage collection? Who will run garbage collection program? When it will be run?

Q2. Solve all the following questions.   **(4x3 = 12)**

a) What is sparse matrix ? Convert the following sparse matrix into non-sparse matrix.

    1   0   0   0

    0

    0

    1

b) Suppose multidimensional arrays A and B are declared using **A (-1:3, 2:6) and B (1:5, -3:1).** Find the length of each dimension and the number of elements in A and B.

```
0    0   -2   11   0
0    0    0    0
0    6    0
0    0    5
```

c) What is header linked list? Use header linked list to store the following polynomial.

$$p(x) = 2x^8 - 5x^7 + 3x^2 + 4$$

d) What is hash data structure? The keys: **32, 18, 23, 2, 3, 44, 5 and 15** are inserted into an initially empty hash table of length 10 with hash function H (key) = key mod 10 and linear probing is used to resolve collision. What is hash table content after every key insertion?

Q3. Solve any THREE of the following questions.   (3x4 = 12)

a) Give an algorithm to implement binary search with its advantages and disadvantages.

b) Explain the concept of skip list with an example. Give its advantages and disadvantages.

c) Sort the following list using radix sort. Show all the passes neatly.

3   45   7   18   9   4   89   103   11   21

d) Suppose we are sorting an array of eight integers using quick-sort, and we have just finished the first partitioning with the array looking like this: **2, 5, 1, 7, 9, 12, 21, 30.** What was the pivot element in the first partition? Also complete the rest of the partitions so that all numbers will be in the ascending order.

Q4. Solve any TWO of the following questions   (2x6 = 12)

a) Write an algorithm to insert a new node at the beginning of the singly linked list.

b) What is singly circular linked list? Write an algorithm to traverse the list and also enlist different operations performed on it and

c) Write a short note on dynamic storage management. Explain how it is done in C.

Q5. Solve any TWO of the following questions   (2x6 = 12)

a) Consider the stack, where N = 6 memory cells allocated. Suppose initially stack contains **A, D, E, F, G** (Top of stack). Then the following operations called in order. Show the stack top and any other situation raised while doing each of the operations.

   i) Push(stack, K)   ii) Pop(stack, Item)   iii) Push(stack, L)
   iv) Push(stack, S)   v) Pop(stack, Item)   vi) Push(stack, T)

b) What is queue? Write an algorithm to implement insert item into queue using singly linked list.

c) Write an algorithm to evaluate postfix expression using stack and execute your algorithm with postfix expression **10, 5, 6, *, +, 8, /.** Show intermediate stack content after each operation.

Q6. Solve all of the following questions.   (4x3 = 12)

a) Give the characteristics of good algorithm. Also explain how do we analyze the algorithm.

b) Store elements of the given below binary tree using

   i) One dimensional array
   ii) Linked list
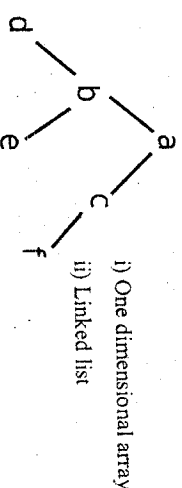
c) What is an Abstract Data type (ADT)? Explain, why queue is called ADT?

d) Explain the following graph terminology with figure
   i) Undirected graph   ii) Total degree of vertex
   iii) Simple path   iv) Cycle

-------------------------Paper End-------------------------

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE – RAIGAD -402 103

Winter Semester Examination – Dec - 2019

Branch: B.Tech. (Computer Engineering)	Sem: III
Subject with Subject Code: Computer Architecture & Organization[BTCOC304]	Marks:60
Date:- 17-12-2019	Time: 3 Hrs

Instructions to the Students:
1. Each question carries 12 marks.
2. Attempt **any five** questions of the following.
3. Illustrate your answers with neat sketches, diagram etc., wherever necessary.
4. If some part or parameter is noticed to be missing, you may appropriately assume it and should mention it clearly.

Q.1	Solve any following questions.	
(A)	What, in general terms, is the distinction between computer organization and computer architecture?	06
(B)	Explain the computer: the top level structure with structural component with neat sketch diagram.	06
Q. 2	**Attempt the following questions.**	
(A)	Enlist and explain any two addressing modes. Given the following memory values and a one-address machine with an accumulator, what values do the following instructions load into the accumulator? • Word 20 contains 40. • Word 30 contains 50. • Word 40 contains 60 • Word 50 contains 70. a. LOAD IMMEDIATE 20 b. LOAD DIRECT 20 c. LOAD INDIRECT 20 d. LOAD IMMEDIATE 30	06
(B)		
I.	Convert the following instruction into Accumulator based CPU, Register based CPU. Instruction:(A*B)-(R+Z)/T	03
II.	Is RISC better than CISC? Illustrate your answer with example of processor.	03
Q.3	**Attempt the following questions.**	
(A)	Given x = 1011 and y = 1001 in twos complement notation (i.e., x = -5, y = - 7), draw and compute the product p = x * y with Booth's algorithm flowchart.	06
(B)	Show how the following floating-point additions are performed (where significants are	06

	truncated to 4 decimal digits). Show the results in normalized form. a. $5.566 \times 10^2 \times 7.777 \times 10^3$ b. $3.344 \times 10^1 + 8.877 \times 10^{-2}$ c. $6.21 \times 10^5 \div 8.877 \times 10^1$	
Q.4	**Attempt the following questions.**	
(A)	What are the differences among direct mapping, associative mapping, and set-associative mapping? A set-associative cache consists of 64 lines, or slots, divided into four-line sets. Main memory contains 4K blocks of 128 words each. Show the format of main memory addresses.	**06**
(B)	Elaborate the concept of SRAM and DRAM memory with typical memory cell structure.	**06**
Q.5	**Attempt the following questions.**	
(A)	What is the overall function of a processor's control unit? A stack is implemented.show the sequence of micro-operations for a. popping b. pushing the stack PUSH 10 PUSH 70 PUSH 8 ADD PUSH 20 SUB MUL	**06**
(B)	What is the difference between a hardwired implementation and a microprogrammed implementation of a control unit?	**06**
Q.6	**Attempt any two questions.**	
(A)	In virtually all systems that include DMA modules, DMA access to main memory is given priority than CPU access to main memory. Why?	**06**
(B)	What is the meaning of each of the four states in the MESI protocol? Can you foresee any problem with the write-once cache approach on bus-based multiprocessors? If so, suggest a solution.	**06**
(c)	How does instruction pipelining enhance system performance? Elaborate your answer using RISC instruction stages.	**06**

**********************End of Paper*********************

DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE-RAIGAD-402 103

Winter Semester Examination - 2019 S

Branch: B. Tech   Sem:-I

Subject:- Digital Electronics & Microprocessor (BTCOC305)   Marks: 60
Date:-19/12/2019   Time:- 3 Hrs

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Instructions:-

1) Each Question carries 12 marks.
2) Attempt any 5 questions of the following.
3) Illustrate your answers with neat sketches, diagram etc, wherever necessary
4) Assume suitable data if necessary and mention it clearly

Q.No.1 a) Explain the working of following gates with their truth table and logic   6
symbol

        a. AND

        b. EX-OR

        c. NAND

    b) Perform the following Conversions   6

        I. $(49.25)_{10} = (\ )_2$

        II. $(4F7.A8)_{16} = (\ )_8$

        III. $(111011)_2 = (\ )_{gray}$

Q.No.2 a) Minimize the following equation using k-map.   6

        I. $Y = \Sigma\ m(0, 1, 2, 4, 5, 6)$

        II. $Y = \pi\ m\ (0, 2, 4, 5)$.

    b) Explain the working of Full Subtractor with Truth table. Implement it   6
with half subtractors.

Q.No.3 **a)** What are the differences between combinational and sequential circuits? 6
Explain gated S-R flip flop with logic diagram and truth table.

b) Draw and explain a 4 bit ring counter using D flip flops. Draw its state 6
diagram and sequence table

Q.No.4 **a)** Explain FLAG register of 8086 6

b) Compare features of 8085 with 8086 6

Q.No.5 **a)** Draw and explain memory read timing diagram in Minimum Mode 6
configuration of 8086

b) Explain hardware and software interrupts of 8086. 6

Q.No.6 **a)** With instruction example explain addressing modes of 8086 6

b) Write a program for addition of two 16 bit numbers using 8086 6

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