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VITH SEMESTER — **B.Tech.(MCE)**

MID SEMESTER EXAMINATION — **(March – 2014)**

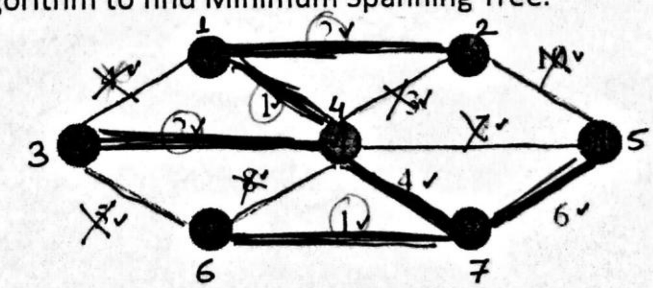
Paper Code: **MC -311** — Title of the subject: **Algorithm Design & Analysis**

Time: 1:30 Hours — **Max. Marks: 20**

Note: Attempt any 4 questions. Assume any suitable value(s) for missing data.

1. Given set of n sorted arrays $\{A_1, A_2, \ldots, A_n\}$ with corresponding size $\{ s_1, s_2, \ldots s_n\}$. Design a greedy algorithm to merge these arrays into a single sorted array. In one step you can merge two sorted arrays. Aim is to minimize total number of elements copied from one array to another array during entire merging process. Solution will suggest order of merging these arrays.(e.g. $((A_1,A_2),(A_3,A_4))$ that array A_1 and A_2 are merged, A_3, A_4 are merged and then their results are merged.).

2. Use Kruskal's Algorithm to find Minimum Spanning Tree.



1+1+2+2

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3. Solve the following instance of 0/1 -knapsack problem for W=20. Compute required matrices and construct the solution.

Item Number	1	2	3	4
Weight	7	2	3	6
Value(benefit)	25	15	20	36

4. Solve following Recurrences using any method.
   (i) $T(n) = T(n/2) + 2^n$ (ii) $T(n) = 4T(n/2) + n^2 \log n$
   (iii) $T(n) = 4T(n/2) + \log n$ → n^2

5. Discuss various types of edges in DFS traversal of a directed graph. How do you classify these edges during DFS traversal.

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SIXTH SEMESTER **B.Tech. [MC]**

MID SEMESTER EXAMINATION ***March-2014***

MC-312 STOCHASTIC PROCESSES

Time: 1:30 Hours ***Max. Marks: 20***

Note: Attempt **ALL** the questions, taking two parts out of the **THREE** set in each.
Assume suitable missing data, if any.

Q.1 (a) What is a stochastic process? Give the classification based on state and parameter of a process. Give an example of each type.

(b) Show that in an unrestricted random walk, the particle drift off to $+\infty$ with probability one if $p > q$ where $p = pror(z_i = 1), q = pror(z_i = -1)$ and $1 - p - q = pror(z_i = 0)$.

(c) Define a Markov Chain. Give example when a Markov Chain is called homogeneous. Give example of a non-Markovian Chain.

(7)

Q.2 (a) What is a Poisson process? Show that in a Poisson process with rate $\lambda>0$, the inter-arrival times $\{\tau_n\}$ of successive events are naturally independent and identically distributed exponential vriates each with mean $1/\lambda$.

(b) A communication source can generate one of the three possible messages 0, 1 and 2. Assume that the transmission can be described by a homogeneous Markov chain with transition probability matrix.

$$\begin{array}{c|c} & \begin{array}{ccc} 0 & 1 & 2 \end{array} \\ \begin{array}{c} 0 \\ 1 \\ 2 \end{array} & \begin{pmatrix} .5 & .3 & .2 \\ .4 & .2 & .4 \\ .3 & .3 & .4 \end{pmatrix} \end{array}$$

and the initial state probability distribution $p^{(0)} = (0.3, 0.3, 0.4)$.
Find $p^{(2)}$= and limiting probability distribution.

(c) Explain birth and death process. Write the differential–difference equation for a general birth and death process and find the steady state solution.

(7)

Q.3 (a) A system can be considered to the in two states "operating" and "under repair " with the lengths of operating period and the period under repair being independent r. v. having negative exponential distribution with mean 1/2 and 1/5 respectively. Find the transition probabilities.

(b) Define continuous-parameters Markov Chain. When it is said to the (i) regular, (ii) non-regular. Give one example of each supported by the proof.

(c) Explain the following:
(i) Periodic and aperiodic states
(ii) Communicating states
(iii) Irreducible chain
(iv) Transient and recurrent states. **(6)**

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SIXTH SEMESTER

B. Tech.[MC]

MID SEMESTER EXAMINATION

March, 2014

MC-313 , *Matrix Computation*

Time: 1.5 Hours

Max. Marks: 20

Note: *Attempt all questions. All questions carry equal marks. Assume suitable missing data, if any.*

1. Drive the formula for the condition number of a matrix and hence find the condition number for the system $\begin{bmatrix} 4 & 1 & 2 \\ 3 & 5 & 1 \\ 1 & 1 & 3 \end{bmatrix}$.

2. Find the largest eigenvalue in modulus and the corresponding eigenvector of the matrix $\begin{bmatrix} -15 & 4 & 3 \\ 10 & -12 & 6 \\ 20 & -4 & 2 \end{bmatrix}$ using the power method.

3. Find the singular value decomposition of the matrix $\begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$.

4. Discuss the complexity of the Gauss elimination for a tridiagonal system.

5. Find the rate of convergence for the Gauss Seidel method to solve the following system.

$$\begin{aligned} 3x + 2y &= 1 \\ x + 2y &= 2 \end{aligned}$$

SIXTH SEMESTER **B.TECH (MC)**

MID SEMESTER EXAMINATION **MARCH 2014**

MC-314 THEORY OF COMPUTATION

Time: 1.30 Hours **Maximum Marks: 20**

Note: **Answer THREE. Question No. 4 is compulsory.**

Q1. Prove that if L is the set accepted by NDFA, then there exists a DFA which also accepts L.

Construct a DFA equivalent to $M = (\{q_0, q_1\}, \{0,1\}, \delta, q_0, \{q_0\})$, where δ is defined by the state table:

State/Σ	0	1
$\rightarrow q_0$	q_0	q_1
q_1	q_1	q_0, q_1

(7)

Q2. Explain the method of constructing minimum automaton equivalent to a given automaton. Hence construct a minimum automaton equivalent to an automaton whose transition table is given below:

State/Σ	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_1	q_3
q_2	q_3	q_4
q_3	q_1	q_5
q_4	q_4	q_2
q_5	q_5	q_5

(7)

Q3. State and prove Pumping Lemma for regular sets. Show that

$\{ w \in \{a,b\}^* : w \text{ contains an equal number of } a's \text{ and } b's\}$ is not regular. (7)

Q4. Prove the following:

(i) $P + PQ^*Q = a^*bQ^*$ where $P = b + aa^*b$ and Q is any regular expression.

(ii) $\Lambda + 1^*(011)^*(1^*(011)^*)^* = (1 + 011)^*$

(iii) If $G = (\{S, C\}, \{a, b\}, P, S)$, where P consists of $S \rightarrow aCa, C \rightarrow aCa/b$ then

$$L(G) = \{a^n b a^n : n \geq 1\}$$

(6)

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VI-SEMESTER ***B.Tech.(MC)***
MID SEMESTER EXAMINATION **March- 2014**

MC-315 Operating System

Time: 1:30 Hours **Max. Marks: 20**

Note: Attempt all questions.

Q.No. 1

A) What is an operating system(OS)? Give four major functions of an operating system and also discuss in detail the responsibility of OS in connection with process management. (3)

B) Consider the set of processes given in the table and following Scheduling algorithms (4)

i. SJF (Preemptive and Non Preemptive)
ii. FCFS

Process	*Arrival Time*	*CPU burst Time*
P1	**0**	**7**
P2	**1**	**5**
P3	**2**	**3**
P4	**6**	**2**
P5	**12**	**3**

If there is a tie within the processes, the tie is broken in the favour of the oldest process. Draw the Gantt chart and find the average waiting time and average turnaround time for above algorithms.

Q.No. 2

A) What is semaphore? What is the usage of semaphore? Explain with suitable example. Suppose At a particular time, value of semaphore is 7, Then 20 **Wait** and 'x' **Signal** operations are completed. If the final value of semaphore is 5 then find the value of 'x'. (3)

B) Describe Producer-Consumer problem with its solution. How does Semaphores solve Producer –Consumer problem? (4)

Q.No. 3 Explain any **two** of the following (6)

A) Process Control Block (PCB) and Context switching.
B) Priority and Multi level queue scheduling algorithm.
C) Critical section Problem and Race condition.

$7 + x - 20 = 5$ 7 → 20 waits)