

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College affiliated to University of Calcutta)

SECOND YEAR [BATCH 2014-17]

B.A./B.Sc. FOURTH SEMESTER (January – June) 2016

Mid-Semester Examination, March 2016

Date : 17/03/2016

Time : 11 am – 1 pm

COMPUTER SCIENCE (Honours)

Paper : IV

Full Marks : 50

[Use a separate Answer Book for each group]

Group – A

(Answer any two questions)

[2×10]

1. a) Write a short note on process creation. [5]
b) What is exponential average in process scheduling? [2]
c) What is the drawback of SJF and how is it resolved? [3]
2. a) Compare direct and indirect communication. [4]
b) Provide a solution for bounded-buffer problem of Producer-Consumer process using semaphore. [6]
3. a) What are the advantages of multithreading? [3]
b) Explain conditions of deadlock using resource-allocation graph. [5]
c) What is virtual machine? [2]

Group – B

(Answer any one question)

[1×15]

4. a) Define Mealy machine. [2]
b) Construct a Moore machine which is equivalent to the following Mealy machine described by its transition table [4]

Present State

Next State

	Next State			
	Input a = 0		Input a = 1	
	State	Output	State	Output
→ q ₁	q ₃	0	q ₂	0
q ₂	q ₁	1	q ₄	0
q ₃	q ₂	1	q ₁	1
q ₄	q ₄	1	q ₃	0

- c) Give DFA accepting the set of strings such that, decimal value of the bit strings are not divisible by 5, over alphabet {0,1}. [4]
- d) Find the regular expression representing the set of all strings over {a,b} in which the number of occurrence of 'a' is divisible by 3. [2]
- e) Check whether the language consisting of all strings of 1's whose length is a prime, is regular language or not. [3]
5. a) Give DFA accepting the language that the set of all strings that either begin or end (or both) with 01. [2]
b) What do you mean by equivalent states or comparable states? [1]
c) Design ϵ -NFA for the language that the set of strings consisting of zero or more a's followed by zero or more b's, followed by zero or more c's. [5]

d) Consider the following ϵ -NFA.

[3+2]

	ϵ	a	b	c
$\rightarrow p$	{q, r}	\emptyset	{q}	{r}
q	\emptyset	{p}	{r}	{p, q}
*r	\emptyset	\emptyset	\emptyset	\emptyset

i) Convert the automata to a DFA.

ii) Give all the strings of length three or less accepted by the automata.

e) Write down the statement of Pumping lemma for Regular language.

[2]

Group – C

6. Answer **any three** questions :

[3×5]

a) Write an algorithm to test whether a graph is bipartite or not.

b) Write a heap sort algorithm and find its time complexity.

c) Let $A[l..n]$ be an array of n distinct numbers. If $i < j$ and $A[i] > A[j]$, then the pair (i, j) is called an inversion of A . Give an algorithm that determines the number of inversions in any permutation on n elements in $\theta(n \lg n)$ worst-case time.

d) Arrange the following function in ascending order of their growth rate.

$n^{1/3}, e^n, n^{7/4}, n \log^9 n, (1.00000001)^n$. Prove that $pn^2 + qn + r = \theta(n^2)$, where $p > 0$.

_____ × _____