

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

B.A./B.SC. THIRD SEMESTER EXAMINATION, DECEMBER 2012

SECOND YEAR

COMPUTER SCIENCE (Honours)

Date : 14/12/2012

Time : 11 am – 2 pm

Paper : III

Full Marks : 75

Use separate answer-book for each group

Group – A

(Answer any five questions)

1. a) Explain the role of Operating System as Resource Manager. 3
b) Comment — “Multitasking is a logical extension of Multiprogramming”. 2
c) What are the advantages of multiprocessing system? 3
d) What is a Virtual Machine? 2
2. a) Explain the need of process synchronization with an example. 2
b) Describe Peterson’s algorithm and also prove it satisfies the all necessary requirements as a solution to the critical section problem. 4
c) Show how synchronization is achieved in producer consumer problem (bounded buffer) using semaphore. 4
3. a) Consider the following five processes with their CPU burst time given in milliseconds. Assume 1 = Max priority and 5 = Min priority.

Process	Arrival Time	Burst Time	Priority
P ₁	0	10	4
P ₂	0	3	1
P ₃	3	8	2
P ₄	4	16	3
P ₅	7	2	5

Now find out the average turn a round time and average waiting time for preemptive scheduling after drawing the Gantt chart. 1+2+2

- b) Differentiate multilevel Queue Scheduling and Multilevel Feedback Queue Scheduling. 2
- c) How binary semaphore is implemented? 3
4. a) Differentiate between physical and logical address. 3
b) What is copy-on-write? 3
c) Consider the following reference string:
4, 3, 2, 1, 4, 3, 5, 4, 3, 2, 1, 5
Calculate the percentage of that would occur if FIFO page replacement algorithm is used with number of frames for the job is equal to 3. 4
5. a) i) Consider the below table with R_j ($j = 1$ to 4) a set of resources and P_i ($i = 0$ to 4) a set of processes.

Processes	Current Allocation				Max Demand			
	R ₁	R ₂	R ₃	R ₄	R ₁	R ₂	R ₃	R ₄
P ₀	0	0	1	2	0	0	1	2
P ₁	2	0	0	0	2	7	5	0
P ₂	0	0	3	4	6	6	5	6
P ₃	2	3	5	4	4	3	5	6
P ₄	0	3	3	2	0	6	5	2

At this moment the available resource instance are:-

R ₁	R ₂	R ₃	R ₄
2	1	0	0

Is the system in a safe state?

2½

ii) Suppose at time t_1 , P_2 has requested the below resource instances.

R ₁	R ₂	R ₃	R ₄
0	1	0	0

Can the request be granted immediately?

3½

b) Show how circular wait condition can be proved false in deadlock prevention.

3

c) “An unsafe state in a system does not always mean to be deadlocked” – Justify.

1

6. a) What is a cyclic graph directory structure?

2

b) Describe file mounting in brief.

3

c) In terms of access control, what are the three classifications of users in connection with each file?

2

d) Differentiate between synchronous and asynchronous kernel IO subsystem.

3

7. a) Briefly describe the different analysis phases of the compiler during compilation of source program.

5

b) For a two assembler, draw the logic flow of the first pass of an assembler.

5

Group – B

8. Answer **any two** questions:

2½×2

a) Design a Turing Machine which recognizes the language $\{(ab)^n \mid n \geq 1\}$.

2½

b) Design a Pushdown automata for the language $\{a^i b^j c^k \mid i, j, k \geq 1, i + k = j\}$.

2½

c) Find the regular expression for the all strings over $\{0, 1\}$ starting and ending with 010 or 0011.

2½

d) Let $G = (\{A, B, S\}, \{0, 1\}, P, S)$ where P consists of $S \rightarrow OAB, A \rightarrow SOB, B \rightarrow SA/01$. Find $L(G)$.

2½

Answer **any two** questions from Question No. 9 to 11:

10×2

9. Prove or disprove if L is a CFL and R is a regular language, then $L \cap R$ is a CFL.

10

10. a) Construct DFA for the regular expression $ab(a+ab)^*(a+aa)$.

5

b) State and prove Arden's Theorem.

4

c) Generate a regular expression with even no. of a 's followed by odd no. of b 's.

1

11. Prove or disprove that the following language $\sum = \{a, b\}$ is context free language:

$$L = \{WW^R a^{|W|} : W \in \{a, b\}^*\}.$$

10

