This question paper contains 5 printed pages.]

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B.Sc. (Hons.) Computer Science/IV Sem.

Paper 401—OPERATING SYSTEMS

(Admissions of 2001 and onwards)

Time : 3 Hours   *Maximum Marks : 75*

(Write your Roll No. on the top immediately

on receipt of this question paper.)

Attempt all questions.

All parts of a question must be answered together.

1. (a) Differentiate between the following :   2*3 = 6

    (i) Symmetric multiprocessing and Asymmetric multiprocessing

    (ii) Interrupt and Trap

    (iii) Message Passing and Shared Memory Model of Inter Process Communication.

    (b) Why do hard real time systems not have virtual memory ?   2

    (c) How does dual mode operation of computers help in providing CPU protection ? With which Intel processor dual mode operation was introduced ?   3 + 1

(2)

2. (a) What is meant by scheduling queues ? Explain with the help of scheduling queue diagram. 2 + 2

   (b) Why are kernel level threads more efficient than user level threads ? Name two applications which uses multi-threading.

   2 + 2

3. (a) Consider the following set of processes, with the length of the CPU-burst time given in milliseconds : 10

Process	Arrival time	Burst Time
P1	0	10
P2	4	8
P3	6	6
P4	6	3

   I. Draw Gantt charts illustrating the execution of these processes using non-preemptive SJF and preemptive SJF.

   II. What is the average turnaround time for each of the scheduling algorithms ?

   III. What is the average waiting time for each of the scheduling algorithms ?

(b) Show that if wait and signal operations are not executed atomically then mutual exclusion may be violated ?   4

(c) Draw the resource allocation graph for the following situation and find if there is a deadlock ?   4

P = {P1, P2, P3, P4}

R = {R1, R2, R3, R4}

E = {P1 → R1, R1 → P2, R2 → P1, R2 → P2, P2 → R3, R3 → P3, P3 → R2, P4 → R4}

Resource	No. of instances
R1	1
R2	2
R3	1
R4	3

4. (a)   Consider logical address space of 8 pages of 1024 words each, mapped on to physical memory of 32 frames. 1 + 1 + 4

I. How many bits are there in the logical address ?

II. How many bits are there in the physical address ?

III. Convert the logical address 1010001010011 to corresponding physical address using the given page table.

Page No.	0	1	2	3	4	5	6	7
Frame No.	2	4	6	15	30	3	28	20

(b) Why do we use hierarchical page table structure ? 4

(c) Consider a paging system with the page table stored in memory. If a memory reference takes 120 nanoseconds, how long does a paged memory reference take ? If we add associative registers, and 90% of all page-table references are found in the associative registers, what is the effective memory reference time ? (Assume that finding a page-table entry in the associative registers takes 10 nanoseconds time, if the entry is there.) 1 + 2

(d) Consider the following page reference string :

1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6.

How many page faults would occur if (i) LRU and (ii) optimal page replacement algorithms are used. Assume four frames are available and all are initially empty. 6

5. (a) What is the combined scheme for maintaining index blocks in indexed allocation of files ? What is an inode in Unix operating system ? 5 + 2

(b) Given the following pending requests for I/O operations from cylinders—86, 1470, 913, 1774, 948, 1509, 1022, 1750, 130. Assume the drive is currently serving a request at cylinder 154 and the previous request was 120. What is the total number of head movement made by C-LOOK algorithm. 3

(c) Explain the working of interrupt driven I/O. 5

(d) Explain briefly (i) Trojan Horse and (ii) Trap Door 3