Question Paper

MANIPAL ACADEMY OF HIGHER EDUCATION

MANIPAL SCHOOL OF INFORMATION SCIENCES, MANIPAL
FIRST SEMESTER MASTER OF ENGINEERING - ME (INTERNET OF THINGS) DEGREE EXAMINATION - FEBRUARY 2021

Operating Systems for IoT [IOT-601]

Marks: 100   **Duration: 180 mins.**

WEDNESDAY, FEBRUARY 10, 2021

Answer all the questions.

1) Write a short note on   (10)

   i. fork ( ) and exec ()
   ii. API and system call
   iii. Process and thread
   iv. Multi programming and multi-tasking (2.5 x 4 marks) (TLO 1.3)

2) Consider three process, all arriving at time zero, with total execution time of 10, 20 and 30 units (10) respectively. Each process spends the first 20% of execution time doing I/O, the next 70% of time doing computation, and the last 10% of time doing I/O again. The operating system uses a pre-emptive shortest job first scheduling algorithm and schedules a new process either when the running process gets blocked on I/O or when the running process finishes its compute burst. Draw the grant chart and calculate average turnaround time and waiting time. (10 marks) (TLO 2.2)

3) What is a semaphore? What are the 2 operations associated with it, Explain them. Also explain how (10) they could be used to achieve synchronization with the help of an example. (2+4+4 Marks) (TLO 2.3)

4) Give the definition of Swap() and TestAndSet() instructions, and write implementation code that (10) provides mutual-exclusion by using these two hardware instructions. Describe how TestAndSet() can be used to provide mutual exclusion that satisfies bounded-waiting requirement. (10 Marks) (TLO 4.2)

5) Write the pseudo code for Safety algorithm used in Banker's deadlock avoidance method. What are (10) the disadvantages of banker's algorithm? Consider the following snapshot of the system.

   Process Allocation Maximum Available
   A B C D A B C D A B C D
   P0 0 0 1 3 0 0 1 3 2 1 0 0
   P1 2 0 0 0 2 7 5 0
   P2 0 1 3 5 6 6 5 7
   P3 2 3 5 5 4 3 5 6
   P4 0 3 3 3 0 6 5 4
   i. Calculate the need matrix and the total resource vector.
   ii. Is the system in safe state? If yes what is the safe sequence?.
   iii. If a request from process P2 arrives for (0, 1, 0, 0) can the request be granted immediately?
   iv. If a request from process P3 arrives for (2, 0, 0, 0) can the request be granted immediately? (2.5 x 4Marks) (TLO 3.1)

6) Explain the two models of Inter Process Communication and the benefits of IPC. (2 x5 Marks) (TLO (10) 4.1)

7) Suppose there are 16 virtual pages and 4 page frames, determine the number of page faults that (10)

will occur with the reference string 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6 if the page frames are initially empty, using each of the following page replacement algorithms: i. LRU ii. FIFO iii. Optimal. (4+3+3 Marks) (TLO 5.2)

8)   On a system with 1 MB of memory and fixed partition of 128K. What is the first request that will fail   (10)
in the following string of requests due to lack of available memory? Requests: 50K, 150K, 90K, 130K, 70K, 80K, 120K, 180K, 60K. At the time of the failed request, how much memory is wasted due to internal and external fragmentation. (10 Marks) (TLO 5.1)

9)   Explain paged segmentation with its benefits over paging. (10 Marks) (TLO 7.1)   (10)

10)   Consider 3 tasks as shown in table. Find the utilization factor of each task. Can the tasks be   (10)
scheduled? Give reason for your answer. Also draw the timeline chart for the same. Higher number indicates higher priority and vice versa.
Period T Comp. Time, C Priority, P
Task1 80 40 1
Task2 40 10 2
Task3 20 5 3
(10 Marks) (TLO 8.1)

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