H Roll No. .....

TCS–503/TIT–503

B. TECH. (FIFTH SEMESTER)
END SEMESTER EXAMINATION, 2018

OPERATING SYSTEM

Time : Three Hours

Maximum Marks : 100

Note : (i) This question paper contains five questions with alternative choice.

(ii) All questions are compulsory.

(iii) Instructions on how to attempt a question are mentioned against it.

(iv) Each part carries **ten** marks. Total marks assigned to each question are **twenty.**

1. Question (a) is mandatory. Attempt any *one* questions of choice from (b) and (c). (2×10=20 Marks)

(a) (i) What is the output of the following code ?

```
#include<stdio.h>
#include<unistd.h>
int a= 10;
```

```
int main ()
{
        if (fork()||fork ())
          fork ();
       printf ("%d",a);
       return 0;
}
```

(ii) Consider a uni-processor system executing three **tasks T1, T2, T3 and T4,** each of which is composed of an infinite sequence of jobs (or instances) which arrive periodically at intervals of **4, 8, 7 and 13** milliseconds, respectively.

The **priority** of each task is **the inverse of its period** and the available tasks are scheduled in order of priority, with the highest priority task scheduled first.

Each instance of T1, T2, T3 and T4 requires an **execution time (period) of 1, 2, 6 and 4 milliseconds,** respectively.

Give that all tasks initially arrive at the beginning of the **1st** milliseconds and task **preemptions are allowed.**

The first instance of T4 completes its execution at the **end of nth milliseconds.** What is the value of **n** ?

Hint : Since priority is inverse of period, T1 is the highest priority task, then T2, then T4 and finally T3.

(iii) At a particular time of computation the value of a counting semaphore is 7. Then 20 P operations and 15 V operations were completed on this semaphore. The resulting value of semaphore is ..... ? 3

(b) What do you mean by virtual memory ? Why is it needed ? Discus the hardware support required by OS to implement the virtual memory concept.

(c) What are the main tasks of an Operating System ? Differentiate about multiprogramming system and time sharing system.

2. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What are the advantages of process cooperation ? How do we achieve process cooperation in operating system ? Explain with diagram.

(b) An operating system uses the Banker's algorithm for deadlock avoidance when managing the allocation of three resource types X, Y, and Z to three processes P0, P1, and P2. The table given below presents the current system state. Here, the Allocation matrix shows the current number of resources of each type allocated to each process and the Max matrix shows the maximum number of resources of each type required by each process during its execution.

	Allocation			Max		
	X	Y	Z	X	Y	Z
P0	0	0	1	8	4	3
P1	3	2	0	6	2	0
P2	2	1	1	3	3	3

There are 3 units of type X, 2 units of type Y and 2 units of type Z still available. The system is currently in a safe state. Consider the following independent requests for additional resources in the current state :

REQ1 : P0 requests 0 units of X, 0 units of Y and 2 units of Z

REQ2 : P1 requests 2 units of X, 0 units of Y and 0 units of Z

Which request **REQ1** alone, **REQ1** alone, both are permitted or none of the request is permitted to obtain a safe state ? Please explain why ?

(c) A computer installation has 1000 k of main memory. The jobs arrive and finish in the following sequences :

Job 1 requiring 200 k arrives
Job 2 requiring 350 k arrives
Job 3 requiring 300 k arrives
Job 1 finishes
Job 4 requiring 120 k arrives
Job 5 requiring 150 k arrives
Job 6 requiring 80 k arrives

Draw the memory allocation table using **Best Fit** and **First fit** algorithms. Which algorithm performs better for this sequence ?

3. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) A certain moving arm disc-storage has the following a specification :

Number of track per surface = 4004
Track the storage capacity = 130030 bytes
Disk speed = 3600 rpm
Average seek time = 30 m secs.

Estimate the average latency, the disc storage capacity and the data transfer rate.

(b) Consider the following reference page numbers :

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

Find the number of Page Faults for the following page replacement algorithm with four free frames which are empty initially :

(i) FIFO

(ii) Optimal Page replacement

(iii) Least Recently Used (LRU)

Which algorithm gives the minimum number of page faults ?

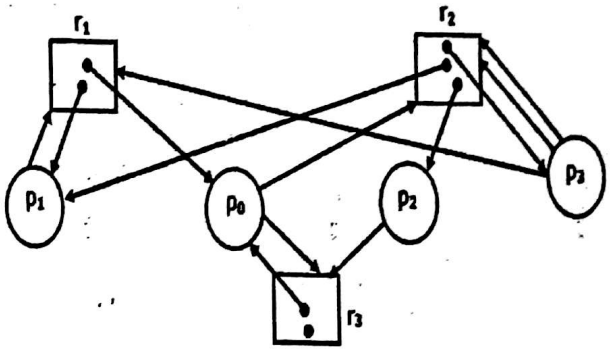
(c) What are different CPU scheduling algorithms ?

4. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) What do you mean by directory structure ? Also discuss different types of directory structures.

(b) What do you mean by fragmentation ? Explain about it ? How to solve the fragmentation problem using paging ?

(c) Check if the below system is in deadlock state ? Does it have any safe sequence ? If yes find it.



5. Attempt any *two* questions of choice from (a), (b) and (c). (2×10=20 Marks)

(a) Write short notes on below :

(i) Thrashing

(ii) Bad Blocks

(iii) LINUX File Structure

(iv) Mutex

(b) A computer has a cache, a main memory, and a disk used for virtual memory. If a referenced word is in the cache, 20 ns are required to access it. If it is in the main memory, but not in the cache, 60 ns are required to load it into the cache, and then

the reference is started again. If the word is not in main memory, 10 ms are required to fetch the word from disk, followed by 60 ns to copy it to the cache, and then the reference is started again. The cache hit ratio is 0.9 and the main memory hit ratio is 0.99, what is the average time in ns to access a word on this system ?

(c) What is critical section problem ? What are the requirements that should be satisfy for the solution of critical section problem ? Write Peterson's algorithm for two process solution.