



Name :

Roll No. :

Invigilator's Signature :

**CS/M.Tech (IT/SE)/ME(CSE)/SEM-1/PGCSE-102/
PGIT-105/PGSE-102/2011-12**

2011

**DISTRIBUTED REAL-TIME OPERATING SYSTEMS/
ADVANCED OPERATING SYSTEMS/
REAL-TIME OPERATING SYSTEMS**

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

GROUP – A

Answer *all* the following.

10 × 1 = 10

1. Define the following terms (as used in Real-Time system literature) :
 - i) Static system
 - ii) Dynamic system
 - iii) Static schedule
 - iv) Dynamic schedule
 - v) Fixed priority schedule
 - vi) Feasible schedule
 - vii) Optimal scheduler

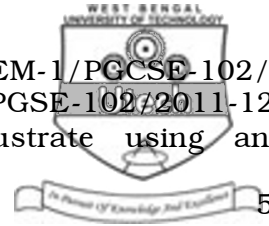


- viii) Tardiness of a job
- ix) Makespan of a schedule
- x) Competitive factor of a scheduling algorithm.

GROUP – B

Answer any *two* of the following. $2 \times 15 = 30$

2. a) Rate monotonic algorithm is being used to schedule a set of tasks $T1 = (3, 1)$, $T2 = (5, 1.5)$, $T3 = (7, 1.25)$ and $T4 = (9, 0.5)$. Find out which of these tasks are schedulable. 7
- b) State the conditions under which the rate monotonic scheduling algorithm is optimal. Prove the optimality of RMS algorithm under the stated conditions. 8
3. a) State the conditions under which the EDF scheduling algorithm is optimal. Prove the optimality of EDF algorithm under the stated conditions. 7
- b) For a frame based cyclic schedule, it is often desirable to choose the frame size such that it becomes possible for the scheduler to determine whether every job completes by its deadline. For this to be possible, derive a relation that must hold between frame size (f) and the periods and relative deadlines of the tasks in the system. 8



4. a) What is priority inversion ? Illustrate using an example. 5
- b) State the rules of the basic priority-ceiling protocol. 6
- c) Explain how the basic priority-ceiling protocol prevents deadlocks. 4

GROUP – C

Answer any *two* of the following. $2 \times 15 = 30$

5. The Mach Kernel is quite different from the widely used UNIX kernels such as Linux and Solaris.

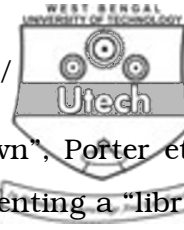
Describe in detail the architecture (*i.e.*, the design) and organization (*i.e.*, the implementation) of the Mach Kernels.

Also discuss its advantages and disadvantages when compared to the above mentioned widely used UNIX kernels.

6. What is a Virtual Machine ? Why are virtual machines important in today's world ? Describe in detail the architecture and organization of the Xen Virtual Machine Monitor.

Discuss how Xen attempts to minimize the performance overhead of the guest operating systems.

Also discuss how Xen attempts to minimize the cost of porting a commodity operating system so that it can be used as a guest OS on Xen ? What is possible disadvantage of this approach ?



7. In “Rethinking the Library OS from Top Down”, Porter et al presented an interesting approach to implementing a “library OS”.

What is a “library OS” ?

Describe in detail the approach used by Porter et al. for implementing a library OS. Also discuss the implications of their approach as far as networking, security and administration of such an OS is concerned.

Briefly mention some of the other approaches being currently used that aim to bring similar benefits.
