

M.Sc. 1st Semester Examination, 2024

COMPUTER SCIENCE

PAPER – COS-104

Full Marks : 50

Time : 2 hours

Answer **all** questions

The figures in the right hand margin indicate marks

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

GROUP – A

Answer any **four** questions from the following :

2 × 4

1. What is a firm real-time task ? Give an example.
2. What do you understand by Relative Deadline and Absolute Deadline ?

(Turn Over)

3. What is the difference between hard and soft real time tasks ?
4. What are the use of checkpointing and roll-back recovery ?
5. What is actuator device in real time system ?
6. What is slack time and how is it utilized in real time systems ?

GROUP – B

Answer any **four** questions from the following :

4 × 4

7. Define Delay, Deadline and Duration timing constraints. Give examples of one performance and one behavioural type of constraints for each of the three types.
8. Discuss about the TMR technique for fault tolerance. What techniques is its software adaptation ? Discuss about that techniques as well.

2 + 2

9. Explain the difference among periodic, aperiodic and sporadic tasks with examples.

10. What do you understand by Major Cycle of a set of real-time periodic tasks ? Consider the following set of periodic real time tasks :

$$T_1 = (e_1 = 1, p_1 = 4), T_2 = (e_2 = 1, p_2 = 5),$$

$$T_3 = (e_3 = 1, p_3 = 20), T_4 = (e_4 = 2, p_4 = 20).$$

Find the appropriate Major Cycle for the set. 2 + 2

11. Suppose a network designed using IEEE 802.4 protocol has three nodes. Node N1 needs to transmit 1MB data every 300ms. Node N2 needs to transmit 1.2MB of data every 500ms. Node N3 needs to transmit 2MB of data every 200ms. Select a suitable TTRT for the network and compute the token holding time for each node.

12. What is context switching overhead time ?

Consider the following set of periodic real time tasks : $T_1(e_1 = 20 \text{ msec}, p_1 = 100 \text{ msec})$, $T_2(e_2 = 30 \text{ msec}, p_2 = 150 \text{ msec})$, $T_3(e_3 = 90 \text{ msec}, p_3 = 200 \text{ msec})$. Assume context switching overhead time does not exceed 1 msec and is to be considered in schedulability computations. Check whether the task set is schedulable under RMA.

2 + 2

GROUP – C

Answer any two questions from the following :

8 × 2

13. (i) Discuss the Liu & Layland's test and Lehoczkey's test in brief. Which one is more stringent and why ?

(ii) Consider the set of following three periodic tasks : $T_1(10, 20)$, $T_2(15, 60)$ and $T_3(20, 120)$ to be run on a uniprocessor

system. Determine whether the task set is schedulable under RMA or not. Draw the appropriate time chart of the schedule.

4 + 4

14. Explain why distributed systems required special scheduling algorithm than microprocessors to schedule real-time tasks ? Briefly explain the Next-fit algorithm for RMA in multiprocessor task allocation.

4 + 4

15. (i) When does RMA no longer remain an optimal scheduling algorithm and what can be a proficient scheduler in that situation ?

- (ii) Consider the following set of periodic real time tasks : $T_1(e_1 = 10, p_1 = 50, d_1 = 35)$, $T_2(e_2 = 15, p_2 = 100, d_2 = 20)$, $T_3(e_3 = 20, p_3 = 200, d_3 = 200)$. Compare the schedulability of this task set under RMA and the most proficient scheduler.

2 + 6

(6)

- 16.** Briefly explain HLP resource sharing protocol.
Prove that when HLP is used for resource sharing, once a task gets the resource it requires, it is not blocked any further. 2 + 6

[Internal Assessment – 10 Marks]
