Reg. No.										

MANIPAL UNIVERSITY

FIRST SEMESTER ME (EMBEDDED SYSTEMS / AUTOMOTIVE EMBEDDED SYSTEMS ESIGELEC, FRANCE / EMBEDDED & WIRELESS TECHNOLOGY / COMPUTING TECHNOLOGIES & VIRTUALIZATION) THIRD SEMESTER MSc. TECH (EMBEDDED SYSTEMS) DEGREE EXAMINATION – NOVEMBER 2015

SUBJECT: ESD 603/ AES 605 / EWT 603/VIR 613 / ESD 603
REAL TIME OPERATING SYSTEMS

Saturday, November 28, 2015

Time: 10:00 – 13:00 Hrs. Max. Marks: 100

✍ **Answer ALL the questions.**

1. Describe the evolution of Operating systems for a uniprogramming system to multiprogramming and multitasking systems. Relate the evolution to the developments in hardware.

(7+3 = 10 marks)

2. What is meant by multithreading? List and explain the 3 multithreading models with neat diagrams.

(1+9 = 10 marks)

3. Four jobs arrive at a computer at times 0,1,2,3 respectively. They have the estimated running times of 9, 5, 6 and 8 seconds. Their priorities are 3, 4, 5, and 2 respectively, with 5 being the highest priority. Draw ***Gantt charts*** and determine the ***turnaround-time*** and ***waiting time*** for each process in the following cases:

   i) Round robin with time slice = 3 time units
   ii) Shortest job first with preemption.
   iii) Priority scheduling with preemption

(4+3+3 = 10 marks)

4. What do you understand by message passing? Explain this scheme under direct communication and indirect communication.

(10 marks)

5. Write the structure of the producer process as well as the consumer process in the classical solution to "Bounded buffer" critical section problem. Clearly indicate the number of semaphores used, their initial values and the purpose of using them.

(7+3 = 10 marks)

6. Explain the following terms:

   i) Deadlock prevention
   ii) Resource allocation graph
   iii) Wait for graph

(4+3+3 = 10 marks)

7. Explain the concept of memory management through various types of memory partitioning schemes.

(10 marks)

8. Discuss the following with an adequate example each:

8A. First come First Served based page replacement policy
8B. Least Recently used page replacement policy
8C. Optimal page replacement policy

(2+4+4 = 10 marks)

9. Consider a swapping system in which memory consists of the following partitions in the following order: 10K, 4K, 20K, 7K, 9K, 12K, 18K and 15K. Which partitions are taken for successive memory requests of 12K, 10K, 9K, 4K, 7K, 13K and 16K for the best fit, first fit and worst fit policies. In this case which algorithm makes most efficient use of memory?

(3+3+3+1 = 10 marks)

10. Consider 2 processes P1 and P2. The periods for P1 and P2 are 50 and 100 respectively. And their processing times are 20 and 35 respectively.

    i) Is it possible to schedule these tasks based on CPU utilization test?
    ii) Draw the **Gantt chart** which depicts the Rate Monotonic scheduling for the above 2 processes. Do the processes meet their deadlines?

(5 marks × 2 = 10 marks)