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Second Semester M.Tech. Degree Examination, June /July 2016
Real Time Operating Systems

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1
 - a. Write pseudocode for basic real time service using polling technique and event driven services. Provide necessary description. (08 Marks)
 - b. Describe the time line diagram of real time system. Represent changes in it if hardware acceleration is used. (08 Marks)
 - c. Write any four key features of RTOS. (04 Marks)

- 2
 - a. Describe isochronal, soft real-time, anytime service and soft isochronal real time services with necessary diagrams. (08 Marks)
 - b. With the help of pseudocode, explain thread safe reentrant codes. (08 Marks)
 - c. Discuss two algorithms for the determination of necessary and sufficient feasibility testing with RM policy. (04 Marks)

- 3
 - a. Derive an expression for RMLUB considering two services. (10 Marks)
 - b. Consider four services s_1, s_2, s_3 and s_4 with release time $T_1 = 2, T_2 = 5, T_3 = 7, T_4 = 13$; having execution time $c_1 = 1, c_2 = 1, c_3 = 1, c_4 = 2$. Write timing diagram for RM policy and calculate individual service utility. Also draw timing diagram for EDF and LLF policies. (Assume $\text{prio}(s_1) > \text{prio}(s_2) > \text{prio}(s_3) > \text{prio}(s_4)$ for fixed priority policy). (10 Marks)

- 4
 - a. Write the equations and conditions for WCET and ACET for hard and soft real time systems respectively. Also list five conditions for I/o overlap situations relative to S_i deadline D_i . (08 Marks)
 - b. Explain ECC memory design using Hamming code. Let $(11000100)_2$ be a data byte. Find the encoded bit stream using Hamming code. Assuming a single bit error at position do_3 of encoded bit stream ; detect and correct the error. (12 Marks)

- 5
 - a. Briefly describe the following :
 - i) Pipelining technique
 - ii) Physical memory hierarchy
 - iii) Deadlock and livelock. (12 Marks)
 - b. Describe unbounded priority inversion. Suggest solutions for it. (08 Marks)

- 6
 - a. Write short notes on :
 - i) Different levels of single step debugging (10 Marks)
 - ii) Exceptions and asserts. (06 Marks)
 - b. Describe three firmware components. (04 Marks)
 - c. Explain reentrant application libraries. (04 Marks)

- 7
 - a. Explain drilldown tuning. (08 Marks)
 - b. Explain message queue and heap based message que communication between tasks. (08 Marks)
 - c. List the basic methods for optimizing code segments. (04 Marks)

- 8
 - a. Discuss reliability with an example, compare reliability and availability. (10 Marks)
 - b. Consider an example of RTOS based digital clock and thermometer application using PIC microcontroller. With necessary pseudocode explain how multitasking is achieved in this application? (10 Marks)

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