NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
B.TECH. VI-SEMESTER :: RETEST
CSPC61- EMBEDDED SYSTEMS ARCHITECTURES

Course/ Branch/Section: B. Tech/ CSE/A **Date: 24.04.2025**
Max. Marks: 20 **Duration: 1 hour**

Answer All Questions

1. a) A real-time system consists of three periodic tasks, each defined by its execution time and period as follows: [2]

Task	Execution Time (C)	Period (T)
T1	2 ms	5 ms
T2	1 ms	10 ms
T3	2 ms	15 ms

Using Rate Monotonic Scheduling (RMS), determine whether the given set of tasks is schedulable.

b) *Differentiate between the state diagrams shown in Fig. 1 and Fig. 2 for an Embedded Operating System.* [3]

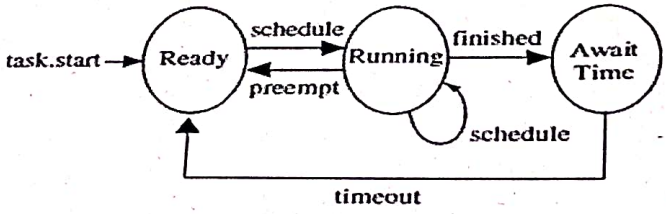

Fig. 1

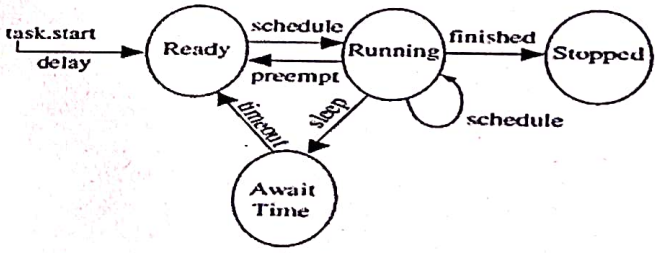

Fig. 2

2. a) *What are the key features specified by an Instruction Set Architecture (ISA)?* [2]

b) *Develop an embedded system to control the speed of a DC fan based on room temperature using a temperature sensor (e.g., LM35) and PWM.* [3]

3. a) Given the architecture of an embedded model, how do you identify whether it belongs to the von Neuman model or the Harvard model? [2]

b) Determine the Earliest Deadline First (EDF) schedule and check if the schedule is feasible. What would be the maximum lateness? [3]

	J_1	J_2	J_3	J_4	J_5
a_i	0	2	0	8	13
C_i	3	1	6	2	3
d_i	16	7	8	11	18

4. a) *Compare the Priority Inheritance Protocol (PIP) and Priority Ceiling Protocol (PCP). Which protocol is more effective in handling priority inversion, and why?* [2]

b) *Design an embedded system for a smart home security system using a microcontroller. The system should be able to detect motion using passive infrared (PIR) sensors and send real-time alerts to the homeowner's smartphone. Discuss the key components of the system, including the choice of microcontroller, communication protocols, power management, and security measures. Explain how you would optimize the system for low power consumption while ensuring reliable operation and data integrity.* [3]