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Code No. : 22657

VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS), HYDERABAD

Accredited by NAAC with A++ Grade

M.E. (E.C.E.) II-Semester Main Examinations, September-2022

Embedded Real Time Operating Systems

(Embedded Systems & VLSI Design)

Time: 3 hours

Max. Marks: 60

Note: Answer all questions from Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

Q. No.		M	L	CO	PO
1.	Mention any two differences between General Purpose Operating System Vs RTOS.	2	2	1	2
2.	Define Kernel and Scheduler.	2	1	1	3
3.	List the different resources used to achieve Inter Task Communication in RTOS.	2	2	2	3
4.	What is deadlock problem?	2	2	2	3
5.	Test whether the three processes P1 (5, 1); P2 (4, 1) and P3 (7, 3) with the given absolute and relative deadlines can be scheduled in Real Time Linux?	2	3	3	2
6.	When a new process is created in Linux, mention the instances of structures that will be created in kernel-space and user-spaces.	2	2	3	3
7.	List the classifications of device drivers in Linux.	2	1	4	2
8.	What is the significance of Copy-On-Write (COW) scheme?	2	2	4	3
9.	Differentiate printf Vs printk functions in the context of device drivers.	2	3	5	2
10.	For an embedded system product with ARM CortexM3 microcontroller unit, the following tasks were identified: Task-1: <u>Sensor_Task</u>: Interfacing a sensor with built-in ADC. Task-2: <u>Networking_Task</u>: Connectivity to cloud over 4G. Propose the priorities to these tasks for efficient scheduling in preemptive RTOS.	2	3	5	3
Part-B (5 × 8 = 40 Marks)					
11. a)	Draw the block diagram of RTOS indicating application interface with the underlying hardware.	4	1	1	2
b)	With the help of timing diagram, differentiate between Preemptive Vs Non-Preemptive kernels.	4	2	1	2

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12. a)	State Rate Monotonic & Earliest Deadline First scheduling algorithms. Mention the differences.	4	2	2	2
b)	Define shared resource. Demonstrate the shared resource problem in accessing a shared function in interrupt-enabled preemptive RTOS.	4	3	2	3
13. a)	Draw the process state transition diagram of Linux created process in User Space, indicating different states?	4	2	3	3
b)	Differentiate fork Vs vfork function in the context of process creation in RT Linux.	4	3	3	3
14. a)	Mention the notable differences between User-space Vs kernel-space in Linux.	4	2	4	2
b)	Draw the block diagram indicating device driver functions associated with a device in Linux.	4	3	4	3
15. a)	Explain the significance of top-halves, bottom-halves and tasklets in RT Linux.	4	3	5	3
b)	List the different Linux versions and their features.	4	1	5	2
16. a)	Define hard real-time system & soft real-time system. With the help of a timing diagram, differentiate these systems in the context of meeting deadlines.	4	2	1	3
b)	What is priority inversion problem? Mention the mechanism to overcome it in RTOS	4	3	2	3
17.	Answer any <i>two</i> of the following:				
a)	Draw the Linux kernel architecture block diagram indicating its built-in components.	4	1	3	2
b)	Define file descriptor. Explain different data structures associated with any device in Linux.	4	3	4	3
c)	Define ISR. Mention any four different methods to test ISRs in RTOS.	4	3	5	2

M : Marks; L: Bloom's Taxonomy Level; CO; Course Outcome; PO: Programme Outcome

i)	Blooms Taxonomy Level – 1	20%
ii)	Blooms Taxonomy Level – 2	37.5%
iii)	Blooms Taxonomy Level – 3 & 4	42.5%
