



VIT[®]

Vellore Institute of Technology
(Deemed to be University under section 3 of the UGC Act, 1956)

Reg. No. :

21BPS1384

Final Assessment Test (FAT) - May 2024

Programme	B.Tech.	Semester	WINTER SEMESTER 2023 - 24
Course Title	EMBEDDED SYSTEMS	Course Code	BCSE305L
Faculty Name	Prof. Bala Murugan M S	Slot	D2+TD2
Time	3 Hours	Class Nbr	CH2023240501892
		Max. Marks	100
General Instructions:			
• Write only Register Number in the Question Paper where space is provided (right-side at the top) & do not write any other details.			

Section - I

Answer all questions (6 X 5 Marks = 30 Marks)

01. Compare the types of embedded systems based on the architecture, features and applications with examples. [5]
02. Write an Arduino program to control rotation angle of the servo motor by rotating potentiometer knob. If the potentiometer at one end, the servo motor must be at 0 degree, when the knob is rotated to the other end the servo motor must reach 180 degree. Also display the Voltage value from potentiometer and the present angle in serial monitor. [5]
03. A secure medical data need to be transmitted from one city to another. It consists of patient name, age, medical condition and blood report. For encrypting the data 80 bit hexadecimal key is required. Use suitable lossless compression technique to compress the key. The 80 bit key as follows BBBCCDDDDDEEEEEBBBB. [5]
04. Design a train ticket vending machine. The machine accepts money only in the denomination of 10 INR, 20 INR, 25 INR, 50 INR and 100 INR. Explain the process of ticket booking for three cities with the help of petrinet model. [5]
Chennai (150 INR)
Bangalore(225 INR)
Hyderabad (450 INR)
05. Explain the types of scheduling algorithm and the significance of necessary test and sufficient test in schedulability analysis. [5]
06. In an UART communication, find number of 8-bit characters that can be transmitted over 38400 baud rates with one start bit, two stop bit and one parity bit. Also, draw the timing diagram of the data packet (10110110) for the same communication protocol. [5]

Section - II

Answer all questions (7 X 10 Marks = 70 Marks)

07. With a neat sketch of the architecture, describe the salient features available in ARM Processor. [10]
08. Write an Arduino program to design a smart dustbin. The dustbin has a sensor for monitoring the level of garbage in bin, suitable lid opening mechanism, automatic detection of type of garbage (organic or inorganic) and should also update the details in serial monitor for user information. List the sensors and actuators required for the design along with Arduino APIs. [10]
09. Draw a neat diagram and explain internal blocks of image capturing device (camera). Elaborate on the architecture and requirements for designing the image capturing devices. Justify processor selection and memory selection criteria of Image capturing device. [10]
10. Draw UML class diagram and state diagram to model a car manufacturing unit with following functions. [10]
- Assembly unit for car wheels
 - Fitting the engine of car
 - Fitting the chases to the car
 - Finally sent for internal electronic design and painting
 - Quality checking of car
11. Assume that the following set of real-time periodic tasks shown in table. Calculate the CPU utilization factor for each task given in the task set & examine whether the given tasks are schedulable or not using EDF scheduling Algorithm? Draw the Gantt chart for the period from 0 to 40 time ticks under EDF algorithm. [10]

Task	Computation Time (Ci)	Period (Pi)
T1	2	20
T2	4	40
T3	10	45

12. A live cultural event was organized with more than 5000 audience and 500 participants. All the event data should be telecast lively and also recorded for the future reference. Suggest an appropriate protocol for data transmission between the video camera, audio system and processing unit. Justify your answer in detail and explain the implementation of the protocol for the above example with required diagram. (Note: choose a two wire synchronous communication protocol with acknowledgment) [10]
13. Choose any two applications of embedded systems in medical electronics and draw a neat block diagram and explain the design process. [10]

