Hall Ticket No | | | | | | | | | | | Question Paper Code: BES204

INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

M.Tech I Semester End Examinations (Regular) - January, 2018

Regulation: IARE–R16

HARDWARE AND SOFTWARE CO-DESIGN

(Embedded Systems)

Time: 3 Hours **Max Marks: 70**

Answer ONE Question from each Unit
All Questions Carry Equal Marks
All parts of the question must be answered in one place only

UNIT – I

1. (a) Create a state based FSM model for the controller that can recognise particular pattern "111". The input is a sequence of binary bits in series. When the FSM see three 1's in a row, it should output "1" – otherwise it should output "0". **[7M]**

   (b) Concurrency is a necessary feature of system language. Explain briefly the group of concurrencies and elaborate on pipelined concurrency. **[7M]**

2. (a) What is behavioural hierarchy? From this context, illustrate sequential behaviour decomposition. **[7M]**

   (b) What is the need of hardware software partitioning? Introduce one of the architecture models illustrating with a figure and explain the need of this architectural model emphasising its importance against others. **[7M]**

UNIT – II

3. (a) What is the necessity of emulation and prototyping?Brief about the emulation system and operation modes. **[7M]**

   (b) Explain any two techniques used for each of specialisation: **[7M]**

   i. Component specialisation

   ii. System specialisation.

4. (a) Explain with diagrams on how presence of system specialisation techniques are applied with dependent co-processors and incrementally controlled co-processors. **[7M]**

   (b) Which are the different classes based on which we can distinguish application systems. Illustrate with a figure on how Motorola MC68332 represents the class of architecture of High Performance Control. **[7M]**

UNIT – III

5. (a) If have a line of code like : **[7M]**

int X, Y;

X=0; Y=6;

X = X+Y

What do we mean by compiling these lines of code? Can you illustrate the output at different steps of compilation considering these lines of code? What is the final output?

(b) Considering that you need to set up a usable development environment, what are the pragmatic issues that needs to be considered. If you are planning to use 'C' language, list out any two limitations that will be encountered. Also explain if there is a way to circumvent the limitation. **[7M]**

6. (a) Take code snippets of 'C' as example and explain the understanding of C code at different abstraction levels. For any project, if you have to develop code, what levels are needed and which level do you desire to code and why? **[7M]**

(b) What is your understanding of debugging source level using host debugging, instruction set simulator and in-circuit emulator (ICE). Illustrate it with figures. **[7M]**

UNIT – IV

7. (a) A washing machine has external events from user like key inputs, door opening, loading clothes for wash and door closing, selection of a programme etc. Do you recommend synchronous computation for the system? Why or why not?Also, distinguish synchronous computation from asynchronous computation. **[7M]**

(b) Explain the semaphore operation with details of how it helps co-ordinating concurrent computation or process? You can take any example to illustrate the same. **[7M]**

8. (a) There is a need to design transmission and reception via UART interfaces UART_ **Transmit() and UART_Receive()** respectively with appropriate parameters and return values. Should these interfaces be designed as blocking or non-blocking operations? Analyse to come to a conclusion on which one is best to the system. Assume any missing inputs but spell out the same to support the analysis. **[7M]**

(b) Explain any two levels of details that are to be paid attention towards interface consistency and verification? **[7M]**

UNIT – V

9. (a) Distinguish the scheme of homogeneous and heterogeneous specifications for system level specifications. List down key issues against each of these schemes. **[7M]**

(b) Explain any two levels of details that are to be paid attention towards interface consistency and verification? **[7M]**

10. (a) You need to develop a sensor system that collects sensor data and communicates the same to server. The system is developed using a microcontroller and communication using WiFi module that interacts with microcontroller via UART. For such a system to develop which attributes do you consider are important and explain how you go about selection of specification language? **[7M]**

(b) Consider a simplified remote motor controller that receives packeted messages from a central controller over a specialised simple bus. The messages are encoded and any error conditions are to be signalled. Can you show how do you partition the system as a heterogeneous system using new approaches in COSYMA? Assume any timing and any other parameters needed. Propose considering different processes for partitioning. **[7M]**