Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 40458

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Seventh/Eighth Semester

Electronics and Communication Engineering

EC 8791 — EMBEDDED AND REAL TIME SYSTEMS

(Common to Biomedical Engineering/ Medical Electronics)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List out the major challenges in designing an embedded system.
2. Compare and contrast top-down and bottom-up design.
3. How do you return from an ARM procedure?
4. For a GPIO pin to be made to act as an ON/OFF switch, which are the registers to be used in ARM?
5. What does a linker mean?
6. Bring out the difference between program counter and program location counter.
7. Mention the limitation of RM algorithm.
8. What is the important metric used for evaluating the performance of an embedded system?
9. What is the difference between the ready and waiting states of process scheduling?
10. Compare the major functionalities of POSIX RTOS and Windows CE.

PART B — (5 × 13 = 65 marks)

11. (a) Assuming the design of model train controller, draw a state diagram for a behavior that sends the command bits on the track. The machine should generate the address, generate the correct message type, include the parameters and generate the error correcting code (ECC). (13)

Or

(b) Elaborate in detail about the various Quality Assurance techniques used for evaluating the embedded systems. (13)

12. (a) Draw the architecture of ARM 9 processor and explain its functional units. (13)

Or

(b) (i) Explain the operation of the BL instruction, including the state of ARM registers before and after its operation. (6)

(ii) Calculate the value to be given in PWMMR0 and PWMMR3 to get a pulsetrain of period 5ms and duty cycle of 25% in ARM. (7)

13. (a) (i) Can you apply code motion to the following example? Explain

```
for (i = 0; i <N; i++)
for(j =0;j <M;j++)
z[i][j] = a[i] * b[i][j];
```

(6)

(ii) Discuss in detail about the various techniques used in "black box testing". (7)

Or

(b) (i) Find the cyclomatic complexity of the CDFG for the code fragment given:

```
if(a<b) {
if(c<d)
x= 1;
else
x=2;
}else{
if(e< f)
x= 3:
else
x= 4;
}
```

(6)

(ii) With a neat flowchart, explain the steps involved in compiling a program. (7)

14. (a) (i) Discuss briefly about the performance degradation of a fault tolerant system. (6)

(ii) Discuss in detail about the timing requirements with respect to release time and deadline for different types of processes. (7)

Or

(b) Mention the classification of faults according to their temporal behavior and output behavior. (13)

15. (a) (i) With relevant examples, bring out the difference between clock driven scheduling approach and priority driven scheduling approach. (6)

(ii) With neat sketches, explain the working of video accelerator. (7)

Or

(b) With neat sketches, explain briefly about the various types of interprocess communication. (13)

PART C — (1 × 15 = 15 marks)

16. (a) Investigate and justify the statement with relevant example – "The timing requirements on a set of process can strongly influence the type of appropriate scheduling. (15)

Or

(b) (i) Find all the def-use pairs for the code fragment given below: (7)

```
x=a-b;
y=c-d;
z=e-f;
if (x<10){
q=y+e;
z=e+f;
}
if (z<y) proc1 () ;
```

(ii) Show the contents of the assembler's symbol table at the end of code generation for each line of the following program: (8)

```
        ORG 200
p1      ADRr4,a
        LDR r0,[r4]
        ADR r4,e
        LDR r1, [r4]
        ADD r0,r0,r1
        CMP r0,r1
        BNE q1
p2      ADR r4,e
```

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Question Paper Code : X10375

B.E./B.Tech. DEGREE EXAMINATIONS – NOV / DEC 2020 AND APRIL / MAY 2021

Seventh/ Eighth Semester

Electronics and Communication Engineering

EC8791 - EMBEDDED AND REAL TIME SYSTEMS

(Common to: Medical Electronics/ Biomedical Engieering)

(Regulations 2017)

Time: 3 Hours Answer ALL Questions Max. Marks: 100

PART- A (10 x 2 = 20 Marks)

1. Mention the need of microprocessor in embedded system.
2. Summarize the challenges in embedded computing system design.
3. List the three different profiles of ARM cortex Processor.
4. Distinguish between single and double edged PWM.
5. Differentiate compiler and cross compiler.
6. Mention the different components for embedded programs.
7. Define Performance measures for real time systems.
8. Outline the definition for a schedule as a function.
9. List the advantages and limitations of Priority based process scheduling.
10. What is priority inheritance and priority inversion?

PART- B (5 x 13 = 65 Marks)

11. a) Design a model train controller with suitable diagram and explain. (13)

OR

b) Demonstrate the goal of design methodology in detail. (13)

12. a) Classify the ARM instruction set and explain any one type of instruction set with example. (13)

OR

b) Discuss about the types of stacks and subroutines supported by ARM processor. (13)

13. a) With the help of a flow chart describe the basic compilation process. (13)

OR

b) Outline the Program level energy and power analysis and optimization. (13)

14. a) Criticize on reliability models for hardware redundancy. (13)

OR

b) Discuss in detail about the structure of a real time system. (13)

15. a) Explain the concepts of Multiprocessor System-On-Chip (MPSoC) and Shared memory multiprocessors used in embedded applications. (13)

OR

b) Illustrate in detail about

i) Characteristics of distributed embedded System. (6)

ii) Architecture of Distributed Embedded System with neat sketches. (7)

PART- C (1 x 15 = 15 Marks)

16. a) Write a program to find the sum of 4X + 9Y + 4Z, where X = 2, Y = 3 and Z = 4 using ARM Processor instruction set. (15)

OR

b) Illustrate video accelerator using UML methodology, from design flow analysis to architectural design. (15)