

Roll No: -----

UNIVERSITY OF PETROLEUM
AND ENERGY STUDIES



End Semester Examination, April, 2017

Program/course: B.Tech ICE
Subject: Embedded Systems
Code : ELEG464
No. of page/s:02

Semester – VIII
Max. Marks : 100
Duration : 3 Hrs

SET-1
SECTION A

Answer all. Each question carries 5 marks.

1. In design of DSP based embedded system justify why the keyword double is used in floating point operation instead of float.
2. In Embedded Systems explain the importance of timers.
3. In scheduling of tasks in RTOS define what “Preemptive” is and explain its use.
4. Define dynamic range in floating point representation of numbers with one example.

SECTION B

Answer any four. Each question carries 10 marks.

5. Using the IEEE-754 standard, design a multiplier by writing its code in C which can multiply two floating point numbers.
6. Explain why hardware/software co-design is an essential requirement in the design of an embedded system application. Also explain the typical co-design process.
7. In RTOS, differentiate between clock driven scheduling and weighted round-robin scheduling.
8. Differentiate between non-real time and real time operating systems by giving examples of each.
9. Consider the following code

```
float x = 3.141592653589793238;  
double z = 3.141592653589793238;  
printf("x1=%f\n", x);  
printf("z1=%f\n", z);  
printf("x2=%20.18f\n", x);  
printf("z2=%20.18f\n", z);
```

Write the outputs of x1, x2, z1 and z2. Explain why outputs are different in each case.

SECTION C

Answer any two. Each question carries 20 marks.

10. Design a RTOS system to perform the following tasks by using scheduler
- A) To scan four switches 10 times per second and turn the motors on and off.
 - B) To check pressure of a gage every 50ms and open a valve if pressure is more than 100psi and once opened close it if pressure drops below 80psi
 - C) Assuming that the system is in network check and process the incoming message. (8+8+4)
11. A) Design an embedded system by writing the C code using 8051 which checks the temperature of a certain class room. If the room temperature exceeds a certain threshold (to be decided by student) an alarm connected to port 0 pin number 4 of 8051 should be raised. If the room temperature is below the threshold then an LED connected at port 0 pin number 7 should be always ON.
- B) In the design parameters of embedded systems what is the different between NRE and RE cost explain with an example (15+5)
12. A) Using the method of recursion write a C code to find factorial of a number
- B) Differentiate between binary semaphore and counting semaphore (15+5)

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SET-2
SECTION A

Answer all. Each question carries 5 marks.

1. Define kernel in real time operating systems. Also mention its special features
2. In 8051 what is the function of overflow flag explain with an example.
3. Consider the following declaration in C programming
i) Unsigned char i; ii) int j;
Explain the memory allocated to these variables and also their range
4. In terms of design flexibility in embedded system explain why FPGA is more flexible than ASIC

SECTION B

Answer any four. Each question carries 10 marks.

5. Explain the function of following pins of 8051
i) $PSEN$ ii) EA/VPP iii) $ALE/PROG$ iv) RXD, TXD
6. A) What are the advantages and disadvantages of using floating point number systems in DSP based embedded systems.
B) What is q-notation for fixed point number system used in DSP? Explain how many integer and fractional bits will be available in $q15$ and $q1.14$ notations. (6+4)
7. What are the different steps involved in embedded system life cycle? Explain
8. In the design of an embedded system
A) What is the use of stack memory?
B) What is interrupt vector table?
C) What is interrupt service routine? (4+4+2)
9. Using the method of recursion write a C code to find sum of natural numbers up to 20

SECTION C

Answer any two. Each question carries 20 marks.

- 10.** A) In the design of embedded system based on 8051 microcontroller formulate a case study by identifying four to five key problems for constructing a LED matrix of size 8x8. Also propose the possible solutions to the problems stated. At the end of the case study to finalize write the concluding remarks.
B) What is the between recursive and non-recursive algorithms used in DSP based embedded systems. (15+5)
- 11.** A) In the design process of embedded system what is the difference between top-down and bottom-up approaches, explain with a flowchart
B) In the design parameters of embedded systems what is the different between NRE and RE cost explain with an example (15+5)
- 12.** A) Design a simple embedded system by writing its C code to detect water level of overhead tank. If the level crosses X meters then raise an alarm and also switch off the pump automatically.
B) As an instrumentation engineer justify why only we use multiprocessor for design of embedded computing system and why not a Personal Computer which will have a single processor. (12+8)