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MINI-029

M.Tech. IN ADVANCED INFORMATION TECHNOLOGY - EMBEDDED SYSTEM DESIGN (MTECHSD)

Term-End Examination

00484

December, 2014

MINI-029 : EMBEDDED C & C++ PROGRAMMING LANGUAGES

Time : 3 hours *Maximum Marks : 100*

Note :

(i) *Section I is* ***compulsory.***

(ii) *In Section II, answer any* ***five*** *questions.*

(iii) *Assume suitable data wherever required.*

(iv) *Draw suitable circuits wherever required.*

(v) *Italicized figures to the right indicate maximum marks.*

(vi) *Use of calculator is allowed.*

SECTION I

1. An embedded system on a nano satellite has to collect weather data at an interval of 2 minutes each. All the interfaced sensors provide analog data. ADC converts the data into digital format, forms a packet and transmits it to the base station. The base station parses the data and displays it on the hyperterminal.

Write the algorithm and pseudo code for implementing the described embedded system while answering the following concerns : *30*

(a) Assume a suitable data packet for transmission and describe it.

(b) Baud rate of USART at the base station. How will you mention the baud rate in the program and how will it be stored in the UBRRH and UBRRL registers after they are PRESCALED ?

(c) The controller is working at a frequency of 8 Mhz.

(d) Data should be sampled and sent only when the nano-sat receives a request from the base station.

SECTION II

2. Give a comparative analysis of the following : $4 \times 3\frac{1}{2} = 14$

(a) Const v/s Static

(b) Static v/s Auto

(c) char v/s uint8_t

(d) #define v/s #include

3. (a) What is the job of preprocessor, compiler, assembler and linker ? What is the difference between static and dynamic linking ? 7

(b) Assume a string with name, age and height, (ex : char s[] = "alex,23,5·11"), parse the string to get all the 3 elements and store them in a structure. 7

4. Write in brief the following : $2 \times 7 = 14$

(a) Depth First Search

(b) Breadth First Search

5. (a) Write a pseudo code for adding a node to a single linked list. Assume that you have the address of root node. 10

(b) Write a program such that the user can enter an int or char or float value, the program has to store it and display it immediately. The memory taken by all the variables together must not exceed 4 Bytes and there must not be any loss of data. 4

6. (a) Single bit manipulation is equally important as manipulating 8-bit ports at a go. More importantly single bit manipulation should not change the state of the rest of the 7-bits in a 8-bit register. Discuss the different methods to set and clear the n^{th} bit in a register. Assume any register and its initial state.
Show logical calculations in support of your answer. *10*

(b) How will you define a macro named MAX which gives the maximum of 2 numbers ? Write a program demonstrating the use of this macro. *4*

7. (a) What is the difference between structure and class ? *4*

(b) Compiling embedded C programs generates hex files. What is the format and content of this file ? Write a function which parses a string in hex file format and validates the data. *4+6=10*

8. With appropriate programming constructs, answer the following : $4 \times 3\frac{1}{2} = 14$

(a) What is the use of *typedef* ?

(b) What are access specifiers ?

(c) Where are stacks and linked lists used ? Give an example for each.

(d) Explain memory allocation in 2-dimensional arrays.