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MANIPAL INSTITUTE OF TECHNOLOGY
MANIPAL
(A constituent unit of MAHE, Manipal)

II SEMESTER M.TECH. (POWER ELECTRONICS AND DRIVES)
MAKE UP EXAMINATIONS, JUNE 2018

SUBJECT: EMBEDDED SYSTEM DESIGN [ELE 5236]

REVISED CREDIT SYSTEM

Time: 3 Hours **Date: 21 June 2018** **Max. Marks: 50**

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Support all your programs with relevant comments

1A. What do you mean by multiprocessor system? How does this improve processing power of a processor? Explain taking the example of multiprocessor system with a main processor and a numeric data processor. ***(03)***

1B. Describe the following instructions of PIC16f877 microcontroller. Illustrate with an example.

i. SUBWF f,d
ii. XORLW K
iii. BTFSS f, b ***(03)***

1C. i. List the various operating modes of ARM7TDMI processor. Mention the visible registers in each of these modes.
ii. Describe the function of following registers
   a. SPSR
   b. R14
   c. R15. ***(04)***

2A. What do you mean by empty descending type of stack? Mention the instructions used for push and pop operation in case of empty descending type of stack. Illustrate with an example. ***(03)***

2B. Write an ARM7TDMI subroutine for unsigned '32' bit division by repeated subtraction. Assume that the dividend and divisor are passed to subroutine through registers 'R0' and 'R1' respectively. Return the quotient through 'R2' and remainder through 'R3' registers. If there is an attempt to divide by zero, return 01 error code in 'R4' register. ***(03)***

2C. Explain the following with respect to data abort exception.

i. When does this exception occur?
ii. What is the main reason for having this exception in APM7TDMI?
iii. What is the expected operation in data abort exception handler?
iv. Mention and describe the instruction used to return from data abort exception handler. ***(04)***

3A. Show the interfacing circuit to interface a common anode seven segment display device to pins p15 to p22 of mbedNXPLPC1768 microcontroller. Write a 'C' program to display 'S','u', 'c','c','e','S','S' with a delay of 1.7 seconds. ***(03)***

3B. Describe and compare the following memory devices used in embedded systems.

i. SRAM
ii. DRAM
iii. EEPROM ***(04)***

3C. Describe the salient features of I2C serial communication bus. Mention the various I2C standard data transfer rates and show a typical I2C connection diagram. ***(03)***

4A. Answer the following with respect to USB serial communication bus.

i. Connection of devices (describe tiered star topology).
ii. Describe in brief the various types of data transfer. ***(04)***

4B. Write a 'C' program for PIC16f877 to configure MSSP in SPI master mode to transmit data byte 4FH to a slave device connected to RB4 pin at 5Mbps baud rate. Consider idle state for clock as low, transmit data at rising edge and sample input data at the end of data output time. Assume fosc = 20MHz. ***(03)***

4C. Describe the salient features and specifications of CAN serial communication bus. ***(03)***

5A. i. Describe the algorithm for converting analog input to digital by on chip ADC in PIC 16f877 microcontroller.

ii. Write a 'C' program to convert the analog input applied to RA0 / AN0 pin of PIC16f877 microcontroller and display the result at ports 'B' and 'D'. Use left justified result, conversion time of 24μs, positive and negative reference voltages from RA3 / AN3 and RA2 / AN2 pins. All the remaining pins of ports A and E should be available as digital I / O pins. Take F_{osc} = 4MHz. ***(04)***

5B. Describe and compare IR and RF waves for wireless communication. List the relative merits and demerits. ***(03)***

5C. With the help of a relevant diagram, describe the daisy chain arbitration scheme for expanding the number of interrupts to a processor. List the merits and demerits of this scheme by comparing it with priority arbitration scheme. ***(03)***