## **Question Paper**

Exam Date & Time: 24-Nov-2018 (10:00 AM - 01:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

# FIRST SEMESTER MASTER OF ENGINEERING - ME (EMBEDDED SYSTEMS & INSTRUMENTATION/AUTOMOTIVE EMBEDDED SYSTEMS)

#### **Embedded Systems [ESI 609]**

Marks: 100

Duration: 180 mins.

# END SEMESTER DEGREE EXAMINATION NOVEMBER 2018

### Answer all the questions.

- <sup>1)</sup> Briefly explain Thumb 2 ISA features and its effect on <sup>(10)</sup> Cortex m3 performance (7 + 3 MARKS)
- <sup>2)</sup> Briefly explain operating modes and Privilege levels of <sup>(10)</sup> Cortex m3? (6+4MARKS)
- <sup>3)</sup> Briefly explain programming model of cortex m3? <sup>(10)</sup>
- <sup>4)</sup> Briefly mention about Interrupts and Exceptions of ARM <sup>(10)</sup> Cortex m3 processor and also comment on Vector table mechanism? (7+3 MARKS)
- <sup>5)</sup> Briefly explain following instructions and device driver library <sup>(10)</sup> functions of cortex m3
  - a) MRS
  - b) MSR
  - c) -enable\_IRQ()
  - d) -set\_BASEPRI(x)
  - e) x=--get\_MSP()

(2 \* 5 = 10 MARKS)

- <sup>6)</sup> Briefly explain about Data transfer instruction of Cortex m3 <sup>(10)</sup> with suitable example
- <sup>7)</sup> Briefly explain SPI communication protocol with suitable <sup>(10)</sup> example
- <sup>8)</sup> Briefly explain the architecture of LPC 1769 with suitable <sup>(10)</sup> block diagram and also explain registers required to program GPIO peripheral of LPC 1769 Microcontroller? (5 + 5 MARKS)

Assuming that Temperature sensor is interfaced to Analog input 0(ad0) of on chip ADC and LED is interfaced to MAT 0 (match out pin of timer0). Write a C program using CMSIS Library to receive character serially through UART at 9600 baud rate. If you receive a character 'A' serially through uart then program ADC to read value from temperature sensor and transfer that value serially through Uart at 9600 baud rate or else if you receive character 'B' serially through uart program Timer to toggle match output pin mat0 for every 200ms delay time period.

<sup>10)</sup> Write short note on Implementing Mutex and Binary <sup>(10)</sup> Semaphore using FREERTOS using suitable examples?

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