

(2½ Hours)

[Total Marks: 60]

N.B. : (1) All questions are **compulsory**.(2) **Figures** to the **right** indicate **full marks**.(3) Draw **neat diagrams** wherever **necessary**.

(4) Symbols have usual meanings unless otherwise stated.

(5) Use of **non-programmable** calculator is allowed.**1. (a) Attempt any one:---**(i) Explain in detail the STATUS REGISTER and OPTION_REG registers of microcontroller 16F877. **8**(ii) Explain the DATA Memory and Program Memory structure in case of 16F877. **8****(b) Attempt any one:---**(i) Discuss any four features of microcontroller 16F877. **4**(ii) Explain the functioning of PWM mode in CCP module. **4****2. (a) Attempt any one:---**(i) Draw a circuit diagram to interface hex key pad to a microcontroller and explain its working. **8**(ii) With help of schematic diagram explain how you will interface a analog temperature sensor to microcontroller 89C51 and display the temperature on LCD display module. **8****(b) Attempt any one:---**(i) Draw a circuit diagram to interface two LED's, two keys and one buzzer to the microcontroller 16F877 and explain its working. **4**(ii) What is PWM technique? How it can be used to control the intensity of LED. **4****3. (a) Attempt any one:---**(i) Draw and explain the format of CPSR. **8**(ii) Draw and explain the data path activity when a data in register is to be stored in a particular memory location. **8****(b) Attempt any one:---**(i) Explain the process of exception entry in detail. **4**(ii) Write a note on the registers visible in the various exceptional modes. **4**

4. (a) Attempt any one:---

- (i) Explain the following ARM7 instructions with examples: **8**
 - (p) STMED sp!, {r0, r1, r3-r5}
 - (q) MRS r0, CPSR
 - (r) STMFA r13!, {r0 - r5}
 - (s) MOVS r1, #0
- (ii) Explain the following THUMB instructions with examples: **8**
 - (p) SUB r6, #14H
 - (q) STRB r3, [r2, #6]
 - (r) SBC r1, r4
 - (s) LSR r6, r7

(b) Attempt any one:---

- (i) Decode the following program in ARM7: **4**

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MRS r0, CPSR
BIC r0, r0, #0x00000080H
MSR CPSR_c, r0
            
```
- (ii) Five, 32-bit nos. are stored in consecutive memory locations starting from offset 0050H. Write an Assembly Language Program in ARM7 to find the smallest from these nos. Store the result in the consecutive memory location. **4**

5. Attempt any four:---

- (a) List the I/O ports with the width of each port in 16F877 **3**
- (b) What is Brown-out reset feature? **3**
- (c) What technique is used to control the direction of rotation in DC motor. **3**
- (d) What are RW, RS and E signals in LCD display module? **3**
- (e) Write a short note on the two internal clock phases of the clock pulse **3**
- (f) Write an assembly language program in ARM7 to SET only the ZERO Flag bit and preserving N, C and Vin the CPSR **3**
- (g) What are the functions of the JTAG TAP Controller? **3**
- (h) How to switch from ARM State to THUMB State and vice-versa? **3**