

Seat No. : \_\_\_\_\_

**MN-137**

**March-2019**

**M.Sc., Sem.-IV**

**509 EA : Physics  
(Microprocessor-II and Microwaves)**

**Time : 2:30 Hours]**

**[Max. Marks : 70**

- Instructions :**
- (1) Attempt **all** questions.
  - (2) Symbols and terminology have their usual meanings.
  - (3) Scientific calculator may be permitted.

1. (a) (i) Assume that Register D holds 24 H, Register E holds 55 H and an Accumulator holds 52 H. Illustrate the results of the instructions DCR D, DCX D, INR D, INC D, ANA D, ORA D, XRA D and CMA. Write program to perform ANDing, ORing, EX-ORing and compliment (A) operations. Show status of sign, zero and carry flags. 7
- (ii) Write a program and draw a flow chart to add fifteen bytes of data stored in memory locations starting from 2060 H, display sum at output port 02H. Data (H): 15, 54, 19, 10, A2, 29, 27, 40, 36, 2F, E1, 22, 71, 30, 34. 7

**OR**

- (i) Seven bytes of data are stored in memory location starting at 2040H. Add all data bytes. Use register B to save carries generated, while adding the data bytes. Store the sum at two consecutive memory locations, 2060H and 2061H. Draw a flow chart.  
Data (H): B8, 2A, AB, E5, 98, 55
- (ii) Assume that the accumulator holds BB H and CY=0. Illustrate the accumulator contents after the execution of instruction RLC, RRC twice.
- (b) Answer in brief any **four** questions from the following : (Each question is of **one** mark). 4
- (i) List various types of counters.
  - (ii) By rotating 08H right twice; (A) = \_\_\_\_\_.
  - (iii) By rotating 10 H left twice; (A) = \_\_\_\_\_.
  - (iv) LDAX B/D is a \_\_\_\_\_ byte/s instruction.
  - (v) LXI SP, 16-bit is a \_\_\_\_\_ byte/s instruction.
  - (vi) What do you understand by “indexing” ?

2. (a) (i) Write a program and draw the flow chart for down, continuous Modulo ten counter to count from 9 to 0 with a one second delay between each count. Use register pair BC to set up one second delay and display each count at one of the output ports. Clock frequency of the system is 1 MHz. (No. of T-state of an inner loop is 24 and an outer loop is 48) 7
- (ii) Write a program and draw a flow chart to provide the given ON/OFF time to three traffic lights (Green, Yellow, and Red) and two pedestrian signs (WALK and DON'T WALK). The signal lights and signs are turned on/off by the data bits of an output port as shown below : 7

	<b>Lights/signs</b>	<b>Data bits</b>	<b>On time</b>
1.	Green	D <sub>0</sub>	20 seconds
2.	Yellow	D <sub>2</sub>	5 seconds
3.	Red	D <sub>4</sub>	25 seconds
4.	WALK	D <sub>6</sub>	20 seconds
5.	DON'T WALK	D <sub>7</sub>	30 seconds

The traffic and pedestrian flow are in the same direction; the pedestrian should cross the road when the Green light is on.

**OR**

- (i) A set of ten packed BCD numbers is stored in the memory location starting at 2050H.
- (1) Write a program with a subroutine to add these numbers in BCD. If a carry is generated, save it in register B, and adjust it for BCD. The final sum will be less than 9999<sub>BCD</sub>.
- (2) Write second subroutine to unpack the BCD sum stored in registers A and B, and store them in the output buffer memory starting at 2060H. The most significant digit -BCD<sub>4</sub> should be stored at 2060H and least significant digit -BCD<sub>1</sub> at 2063H.
- (ii) Write a program and draw a flow chart to generate a continuous square wave with the period of 600 micro second. The system clock period is 325 ns. and use bit D<sub>0</sub> to output to the square wave. (T-state of outer loop = 46, T-state of inner loop is 14- during last cycle and 11 before last cycle).
- (b) Answer in brief any **four** questions from the following : (Each question is of **one** mark). 4
- (i) Draw a flow chart of a Counter.
- (ii) Define a counter.
- (iii) List the difference between CALL and RET instructions.
- (iv) Draw a flow chart of time delay.
- (v) List various techniques to provide time delay.
- (vi) What is a stack ?

3. (a) (i) Draw the schematic diagram of a reflex klystron. Explain how velocity modulation and bunching of electrons are achieved. 7
- (ii) Obtain the equation for bunching parameter of a reflex klystron. 7

**OR**

- (i) Draw schematic diagram of the helix type travelling wave tube. Explain the process of amplification in it.
- (ii) Describe principle, construction and mechanism of oscillation in Read diode.
- (b) Answer in brief any **three** questions from the following : (Each question is of **one** mark). 3
- (i) What is negative resistance effect in Gunn diode ?
- (ii) What is IMPATT diode ?
- (iii) Define  $\pi$ -modes in magnetron oscillator.
- (iv) State two main differences between transistor and TED.
- (v) With increase in number of cavities in a multicavity klystron amplifier gain of the amplifier \_\_\_\_\_ (increases, decreases, remains same).

4. (a) (i) What is magic tee ? How it works ? Explain application of magic tee as a circulator. 7
- (ii) Obtain the scattering matrix for E-plane tee. 7

**OR**

- (i) Explain structure and working of Faraday rotation isolator. 7
- (ii) Describe slotted line method of measuring unknown frequency of a microwave generator.
- (b) Answer in brief any **three** questions from the following: (Each question is of **one** mark). 3
- (i) What is Gyrator ?
- (ii) What is Bolometer ?
- (iii) For a directional coupler define coupling factor.
- (iv) What are the applications of microwave Isolator ?
- (v) How many elements are there in s- matrix of a four port microwave device ?
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