Seat No. : _____

NH-135

November-2025

M.Sc., Sem.-III

PHY-503 : Physics

(Nuclear Physics-II and Micro-processor-II)

(New Course)

Time : 2:30 Hours] **[Max. Marks : 70**

Instructions : (1) Attempt **all** questions.
(2) Symbols and terminology have their usual meanings.

1. (A) Discuss square well infinite depth potential in detail and write its importance. **7**
   (B) Define compound nucleus and discuss the validity of Bohr's hypothesis of compound nucleus with different experiments. **7**

   OR

   (A) Explain resonance in nuclear reaction and derive Breit-Weigner dispersion formula for $1 = 0$. **7**
   (B) Discuss: Continuum theory of cross-section for compound nucleus. **7**

2. (A) Express the elementary particles in terms of their spins and explain fundamental interaction between the particles in details. **7**
   (B) Discuss Parity and G-parity in details. **7**

   OR

   (A) Discuss: CP-violation in natural K-meson. **7**
   (B) Explain: (1) Charge Conjugate and (2) Time reversal **7**

3. (A) Write a program and draw a flow chart to add six bytes of data stored in the Memory locations starting from 2050 H. Use register B to save any carries generated, while adding data bytes. Display the entire sum at two consecutive memory locations 2070 H and 2071 H. Data (H): A2, FA, 29, 27, 40, 36. **7**
   (B) Assume that Register B holds data byte 93 H, and an Accumulator holds 32 H. Illustrate the results of the instructions ORA A, XRA B, DCR B, INR B separately. Show status of sign, zero and carry flags. **7**

   OR

   (A) Discuss programming techniques; Looping, Counting and Indexing. Assume that the accumulator holds data byte 66 H and CY=1. Illustrate the accumulator contents after the execution of instruction RLC, RAL, RRC and RAR once. **7**

(B) Write a program and Draw a flow chart to do following : **7**

(1) Load the number 50 H in Register B and 59 H in Register C.

(2) Subtract 59 H from 50 H.

(3) Display the answer at Output PORT 01 H.

Show steps of subtraction and write status of S, Z and CY flags.

4. (A) Write a program and draw a flow chart to do the following :

Write a program and draw the flow chart for continuous Modulo ten up 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**

(B) Discuss following advanced subroutine concepts : **7**

(i) Nesting

(ii) Multiple calling of a subroutine

(iii) Multiple Ending.

OR

(A) Write a program and draw a flow chart to generate continuous square wave waveforms with the period of 600 micro second. The system clock period is 325 ns. And use bit D_0 to output to the square wave. (Number of T-state of outer loop = 46, T-state of an inner loop is 14-during last cycle, and 11 before last cycle). **7**

(B) A multiplicand is stored in memory location 2050 H and a multiplier is stored in location 2051 H. **7**

Write a main program to

(i) transfer the two numbers from memory locations to the HL registers

(ii) store the product in the Output Buffer at 2090 H.

Write a subroutine to

(i) multiply two unsigned numbers placed in registers H and L

(ii) return the result in to the HL pair.

5. Answer the following : (any **seven**) **14**

(1) Write failure of Ghoshal experiment on compound nucleus.

(2) Define differential - cross section.

(3) Define direct reaction.

(4) Define CPT - theorem.

(5) Quarks are assigned electric charge values for A = _____ , B = _____ and C = _____ .

(6) Define quarks.

(7) What do you understand by Debugging of a program ?

(8) Explain instruction DAD SP.

(9) List the difference between CALL and RET instructions.

(10) 96 H-7F H = _____.

(11) Convert F6 H into decimal number.

(12) Assume two digit BCD number is 52, so its equivalent binary is = _____

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Seat No. : _____

NH-135

November-2025

M.Sc., Sem.-III

PHY-503 : Physics

(Satellite Communication, Fiber Optics & Micro-processor-I)

(Old Course)

Time : 2:30 Hours] **[Max. Marks : 70**

1. (A) Derive an expression for field strength at a distance in case of space wave propagation. **7**

   (B) What do you understand by power budgeting of satellite links ? Discuss in detail uplink power budgeting in the context of geostationary satellites. **7**

OR

1. (A) Derive an expression for refractive index of ionosphere and then obtain an expression for critical frequency of ionosphere. **7**

   (B) What is a transponder in the context of satellite communication ? With help of a block diagram describe the satellite transponder. Mention power levels at various stages. **7**

2. (A) What is acceptance angle ? Discuss in brief. Obtain an expression for the Numerical aperture of an optical fiber for meridional rays drawing necessary figure. **7**

   (B) Explain the Phase and group velocity in optical fiber. Hence obtain an expression for the group velocity in terms of group index of the guide. **7**

OR

2. (A) What is dispersion ? Explain material dispersion and obtain an expression for material dispersion parameter M. **7**

   (B) Discuss fiber alignment and joint loss. Hence, explain the possible types of misalignments that may occur when joining optical fibers. **7**

3. (A) What do you understand by an operating system ? Draw relevant schematic for operating system and its functional relationship with various hardware components and discuss 'Personal Computers (PCs). **7**

   (B) What is a Flag Register ? Draw relevant schematics of (i) Hardware Model, (ii) 8085 Programming Model and discuss various components of both models. **7**

OR

3. (A) What is a Program ? Draw (i) a block diagram of a computer with Microprocessor as CPU and (ii) a block diagram of a Microcontroller. Discuss various components of each. **7**

(B) What is an ASCII code ? Discuss (i) Machine language and (ii) High level language. **7**

4. (A) Give classification of Memory. Discuss (i) R/WM- Read/ Write Memory, (ii) Advances in Memory Technology. **7**

(B) Draw a functional block diagram of 8085A Microprocessor. Discuss various parts of it. **7**

OR

4. (A) What is the difference between buffer and tri-state buffer ? Give examples of tri-state buffers. Draw a logic diagram and a Function Table of the 74LS244 Octal Buffer. Also explain how it works ? **7**

(B) Draw a pin and signals diagram of the 8085 MPU and, discuss various sections. **7**

5. Attempt any **seven** questions from the following Each question carries **two** marks. **14**

(1) Write down expressions for plasma angular frequency and maximum usable frequency of ionosphere.

(2) What is meant by attitude of a satellite ? Name two methods of stabilizing satellites in orbit.

(3) Explain the importance of Kepler's second law in the context of satellite motion.

(4) For a graded index fiber with triangular profile α = _____

(5) What is the fiber splice ? Mention two types of splicing techniques.

(6) What is the Evanescent field ?

(7) LDA H, 16-bit data is ____ byte/s instruction.

(8) 20 (decimal) = _____ H.

(9) Explain instruction 'LXI 2050H'.

(10) Write names of various control and status signals used in 8085 MPU.

(11) Explain the instruction 'NOP'.

(12) Draw a symbol for a Latch and write use of Latch in Microprocessor.

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