This question paper contains **4** printed pages]

Roll No. | | | | | | | | | | | |

S. No. of Question Paper : **1466**

Unique Paper Code : **2221302** **F-7**

Name of the Paper : **Digital System and Applications**

Name of the Course : **B.Sc. (Hons.) Physics/(II)/Admitted previously under FYUP**

Semester : **III**

Duration : **3 Hours** Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all.

Question No. **1** is compulsory.

1. Answer any *five* of the following : 5×3

(*a*) Using Boolean Algebra prove that :

$$\bar{A}B + BC + AC = \bar{A}B + AC.$$

(*b*) What is an integrated chip ? Give *two* advantages and disadvantages of an IC.

(*c*) Add the decimal numbers 48 and 27 after converting each to its BCD code. Represent the answer in the BCD code.

(*d*) What is the function of the *Reset* and *Hold* signals in 8085 microprocessor.

(*e*) Implement 4 input NAND gates using 2-input NAND gates.

P.T.O.

(*f*) Realize F(ABC) = $\Sigma\, m(0, 1, 3, 4, 8)$ using an 8 to 1 multiplexer. Use only the block diagram of the multiplexer.

(*g*) A binary counter is being pulsed by a 256 KHz clock signal. The output frequency from the last flip-flop is 500 Hz. Determine the number of flip-flops used in the counter and the MOD number.

(*h*) Draw the truth-table of a full subtractor.

2. (*a*) Simplify the expression using Karnaugh-map and draw its logic circuit using NAND gates only :

$$f = \Sigma\, m(4, 6, 9, 10, 11, 14, 15) + \Sigma\, d(0, 1, 2, 3).$$ 6

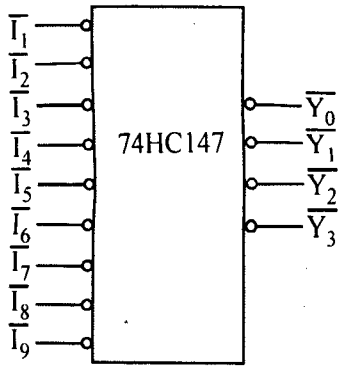
(*b*) What is PROM and E-PROM ? Describe the construction and working of a 8 × 4 diode ROM to write nibbles from 0000 to 0111. 6

(*c*) Subtract $(-35)_{10}$ from $(-15)_{10}$ using 2's complement method. 3

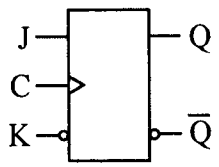
3. (*a*) Draw a circuit of parallel in-serial out shift register and explain its working. 8

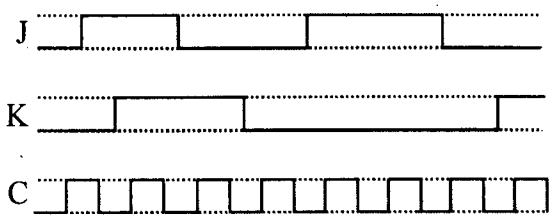
(*b*) Differentiate between demultiplexer and decoder. 4

(*c*) In the figure below, 74HC147 is a decimal to BCD encoder. What sort of input conditions would be required to generate the code for the number 7 and how that numerical quantity would be represented on the output (Y) lines ? 3



4. (*a*) Determine the Q output of the J-K flip-flop, if initially the flip-flop is reset. 4





(*b*) Draw the circuit diagram and explain the working of a 4-bit adder-subtractor. 6

(*c*) Give the truth-table and the circuit diagram of a JK flip-flop having preset and clear conditions. How is racing condition eliminated in JK flip-flop ? 5

5. (*a*) What are ring counters and where is it used ? 3

(*b*) Explain the working of a decade counter with the help of its circuit diagram. Draw its output waveforms and also write its truth-table. 8

(*c*) Explain glitches. How do we remove them from the output ? 4

6. (*a*) Explain the function of pins 2 and 4 of the IC 555. 3

(*b*) Draw the circuit diagram of 555 timer as a monostable multivibrator and explain its working. 6

P.T.O.

(*c*) Design a monostable multivibrator using 555 timer to get an output with a positive pulse of 10 ms. For this multivibrator, draw the output waveform a pin 3 when the input trigger has pulse width 2 ms and time periods are :

(*i*) 15 ms

(*ii*) 9 ms. 6

7. (*a*) Give the timing diagram of the following : 6

Memory Address	Machine Code	Mnemonics
2050H	41H	MOV B, C

(*b*) Describe with an example, each of 1 byte, 2 byte and 3 byte instruction in 8085 microprocessor instruction set. 6

(*c*) The memory requirement for an 8085A microprocessor based system is 24K-bytes RAM chips and 8K-bytes ROM chips. If memory chips of size 1K × 4 bits are available for both RAM and ROM, how many RAM and ROM chips are required ? 3

8. (*a*) Write an assembly language program to substract 5DH from FCH stored in memory locations 2006H and 2007H respectively using (*i*) direct and (*ii*) indirect addressing modes. The difference is to be stored in memory location 2008H and borrow in 2009H. 5

(*b*) Distinguish between memory-mapped I/O and peripheral-mapped I/O. 3

(*c*) What are flags ? If the accumulator contain 0BH and register C contain 05H, which flags are affected when CMP C is executed ? 4

(*d*) Define instruction cycle, machine cycle and T-states. 3