Question Paper Set A

Name of Course:	**B.Sc. (Hons) Physics – CBCS Core**
Semester:	**III Semester**
Name of Paper:	**Digital Systems and Applications**
Unique Paper Code:	**32221303**

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

Instructions for the Candidates:
(a) Attempt **four** questions in all
(b) All questions carry equal marks
(c) Symbols have their usual meanings

Q-1 (a) Draw labelled diagram of a cathode ray tube (CRT) and explain the role of each part. Explain why Sawtooth waveform is preferred for time base instead of a sine wave? Give two examples where CRT are used.

(b) In an oscilloscope, a 20 V sinusoidal signal produces a deflection of 2cm corresponding to a certain setting of vertical gain control. If another voltage produces 7.3 cm deflection for the same setting of the vertical gain control, what is the peak-to-peak and rms value of the voltage?

Q-2. (a) A four variable truth table produce logic 1 output when the number of 1s in the input variables is even. Generate the Truth Table for the problem considering the output as don't care for the terms for which the decimal equivalent of the input variables is 0, 1, and 2; and 0s for the remaining left. Determine the simplest SOP equation for this truth table using K-Map method and design the logic circuit for the function using NAND gates and XOR gates only.

(b) Use Boolean laws to simplify the expression,

$$Y = \overline{(A + \overline{BC})}(A\bar{B} + ABC)$$

Q-3 (a) Draw truth table of a full subtractor circuit and implement it using half subtractors. The SUB input control signal of a full adder/subtractor circuit is connected to the output of a 4-input XOR gate. Tabulate the combinations of the XOR gate input variable for which the adder/subtractor circuit perform the task of (i) Addition and (ii) Subtraction.

(b) Draw the logic circuit of a clocked RS Flip Flop using NAND gates and explain its truth table. What is RACE CONDITION in RS Flip Flop and what is its implications.

Q-4 (a) Design a monostable multivibrator using 555 timer with an unstable state which is 10 ms long. If the trigger input pulse to the monostable multivibrator has the time period of (a) 4ms and (b) 15 ms respectively, draw the corresponding waveforms at

the output terminal of 555 IC and across the capacitor. Why 555 timer IC pins 4 and 8 has to be tied to positive voltage and pin 5 to ground in a monostable circuit? Write down the applications of monostable multivibrator.

(b) How do you generate the trigger pulse, used in monostable circuit, if you are only provided with the 555 timer IC, instead of a function generator.

Q-5 (a) Explain the working of instructions DAD, ORI and POP for an 8085 microprocessor. Explain with a circuit diagram why the bus AD_7 - AD_0 needs to be demultiplexed.

(b) Write a general assembly language program to multiply any two 8-bit numbers using indirect addressing. The numbers are stored in two memory locations and the final result is stored in the subsequent two memory locations.

Q-6 (a) How many address lines are required by a microprocessor to address 256KB of memory locations? If we use memory chips of the size 2048X8, how many address lines are required for selecting the chip and how many are required for uniquely identifying the location within the chip? If the clock frequency of microprocessor is 5MHz, how much time is required to execute an instruction of 10 T states?

(b) A memory bank uses 16-line address bus and 8-line data bus. The first 32 KB of the memory is allocated to a ROM's of 16 KB, and the remaining space to the RAM's of 8KB each. Write down the initial and final addresses of each chip in the entire memory map.