M.Sc. 1st Semester Examination, 2024

PHYSICS

(Digital Electronics)

PAPER—PHS-108

Full Marks : 25

Time : 1 hour

Answer **all** questions

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

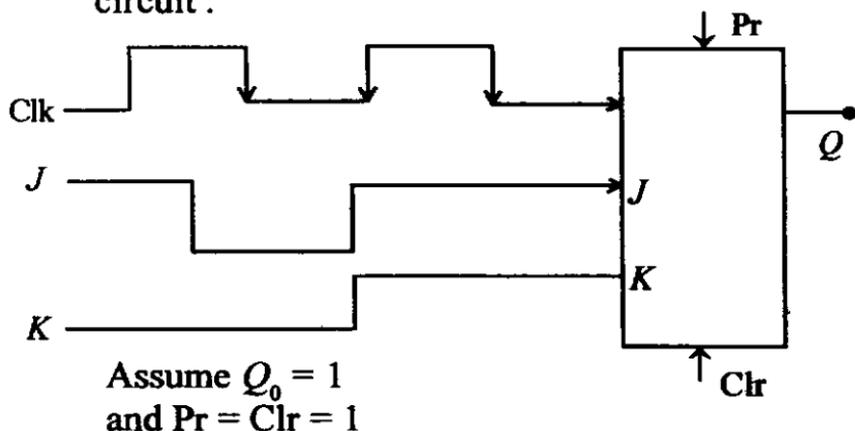## GROUP – A

Answer any **two** questions : 2×2

1. In a 4-bit asynchronous counter every flip-flop has 100 nsec propagation delay. Determine the maximum frequency of the clock pulse that can be used in that counter.

2. Give the equivalent digital circuit of the following Karnough map :

AB \ CD	00	01	11	10
00	1			1
01		1	1	
11		1	1	
10	1			1

3. Give the output waveform for the following circuit :

Assume $Q_0 = 1$
and $Pr = Clr = 1$

4. What do you mean by astable, monostable and bistable multivibrator ?
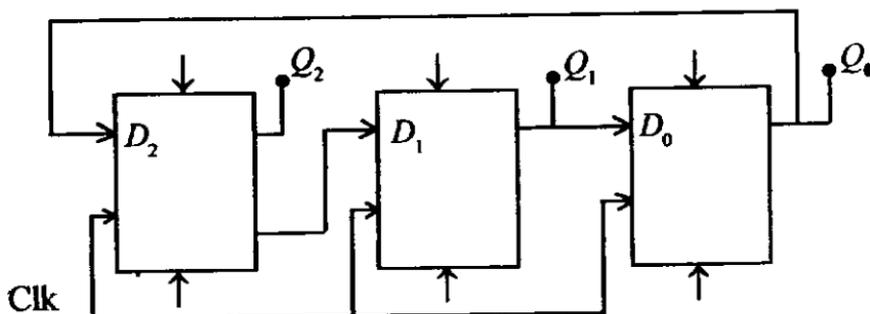
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GROUP – B

Answer any **two** questions : 4×2

5. Design a circuit which has the following state diagram :
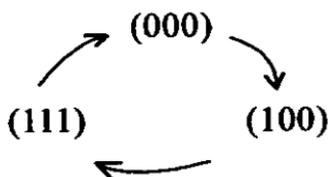
6. Write down the different output states of the following Flip flop circuit. Explain the operation assuming the initial output as (000).

7. What do you mean by universal register ? Draw the circuit of 3-bit PISO register. 1 + 3

8. (a) In a 4-bit digital circuit the input is in BCD form and output goes high when the input is equivalent to a prime number. Write down the truth table.

(b) Draw a circuit to check two digital signals, $A(A_1 A_0)$ and $B(B_1 B_0)$, are equal or not. 2 + 2

GROUP – C

Answer any **one** question : 8 × 1

9. (a) Draw a circuit of 3-bit synchronous up/down counter with a mode selector for selecting upcount or down count.

(b) Design a circuit which can convert a 10 KHz signal into 1 KHz signal and explain its operation. 4 + 4

(*Continued*)

10. (*a*) Convert a JK FF into a T FF.

(*b*) Draw the circuit of 3-bit bi-directional SISO register which can flow data from left to right or right to left in a controlled way.   4 + 4

[**Internal Assessment — 5 Marks**]