PG 1st Semester Examination, 2023

PHYSICS

PAPER — PHS-104.1 & 104.2

Full Marks : 50

Time : 2 hours

The figures in the right hand margin indicate marks

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

PAPER — PHS-104.1

(*Analog Electronics*)

(Attempt **Q1, Q2** and any **one** from the rest)

GROUP — A

1. Attempt any *two* of the following questions :
   2 × 2

   (*a*) What is skip distance in radio wave propagation ?

(b) Define the terms : Tropospheric Waves, Surface wave propagation.

(c) Define slew rate of an Op-Amp. What is it's value for an ideal Op-Amp ?

(d) Why TV and FM radio waves cannot propagate through long distances ?

GROUP — B

2. Attempt any *two* of the following questions :

4×2

(a) Explain the method of generation of Single Side Band (SSB) signal using phase cancellation method. Draw the waveform of SSB signal.

(b) With necessary block diagram, explain the operation of a superheterodyne FM radio receiver. Write the value of intermediate frequency used in FM receiver.

(c) Draw the circuit diagram of emitter coupled differential amplifier and derive the condition for which it will offer infinite CMRR.

(*d*) Explain the operation of Doppler RADAR.

3. (*a*) Draw the circuit diagram of a current mirror circuit using low β transistors and show that it will behave as a current mirror circuit deriving the necessary mathematical expression.   4

(*b*) Derive RADAR range equation.   4

4. (*a*) Explain the operation of Foster Seeley discriminator for the demodulation of FM signals with the drawing of the necessary circuit diagram.   5

(*b*) Explain the method of generation of stereo FM signal. Also show how we can recover the L and R audio signals at the stereo FM receivers.   3
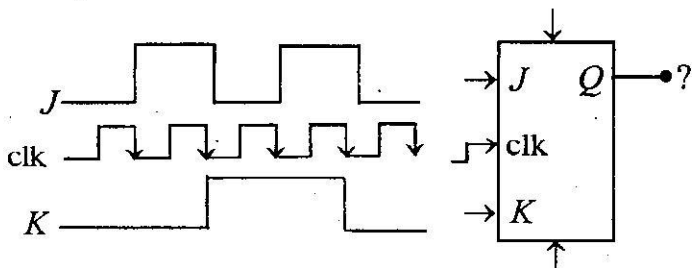
PAPER — PHS-104.2

(*Digital Electronics-I*)

GROUP – A

1. Answer any *two* bits : 2×2

(a) Draw the waveform of the following output

(b) What will be maximum frequency of the clock pulse that can be used in a 4-bit asynchronous counter ? consider the t_{pd} for each flipflop is 10 nano second.

(c) Draw the Karnangh map for a 4 bit circuit which receives BCD input and gives high output when input is in odd number.

(d) Draw a circuit which can convert a 5kHz signal into 1kHz signal.
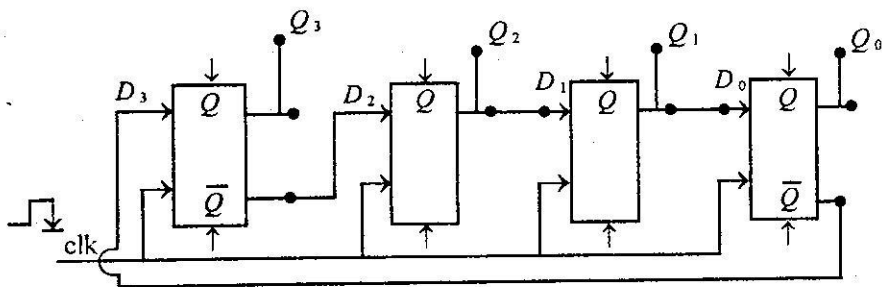
GROUP – B

2. Answer any *two* bits :   4 × 2

(a) Draw the circuit of a synchronous 3-bit up/down counter and explain the operation briefly.

(b) (i) What do you mean by SIPO register ?

    (ii) Explain the output states of the following circuit. Assume initially   1 + 3
$$Q_3 = Q_2 = Q_1 = Q_0 = 0$$

(c) (i) What do you mean by as table multivibrator ?

(ii) Draw a circuit, using 555 timer IC, to produce a square wave of frequency 15 KHz.
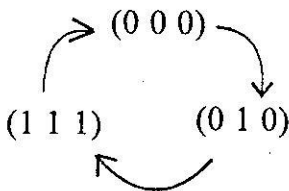
(d) Convert a D flipflop into T flipflop.

GROUP — C

3. Answer any *one* bits : 8×1

(a) (i) Write down the excitation table of T flipflop.

(ii) Using T flip-flops design a synchronous counter circuit which has the following output states $2 + 6$
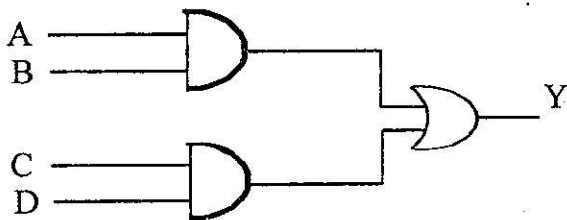

(b) (i) Solve the following digital equation by Karnangh map
$$Y = \prod_m (0, 3, 4, 7, 8).d(11, 12, 15)$$

(ii) Draw a circuit to check two signals A(A_1 A_0) and B(B_1 B_0) are equal or not.

(iii) Design the following circuit with NAND gates.   3 + 3 + 2

[Internal Assessment — 10 Marks]