M.Sc 1st Semester Examination, 2009

PHYSICS

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

PAPER—PH-1104 (A)

[*Marks* : 20]

Time : 1 hour

Attempt **Q.No.1** and any *one* from the rest

1. Attempt any *five* bits :   2 x 5

   (*a*) Define maximum usable frequency (MUF) in case of radio wave propagation.

   (*b*) Describe the operation of a current mirror circuit used in the design of op-amps.

(*Turn Over*)

(c) What is fading in radio wave communication ?

(d) Explain why the gain of a practical op-amp falls at high frequencies.

(e) Why MOSFETs are less noisy than BJTs ?

(f) Discuss how the maximum range of a RADAR can be increased.

(g) Find the value of the output voltage of the following circuit.

(Continued)
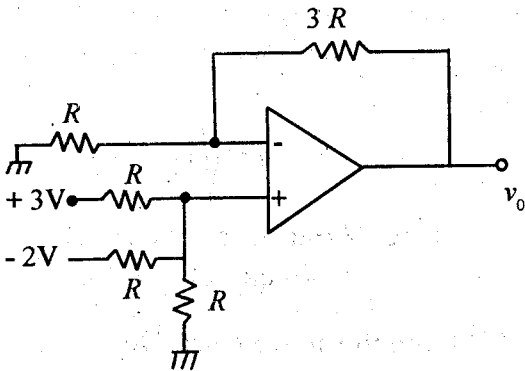
(h) Find the high frequency input impedance of the following op-amp circuit.
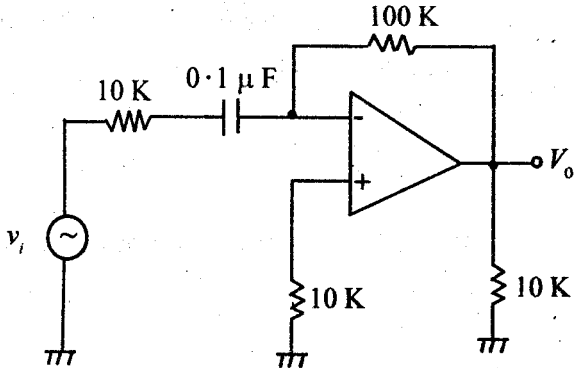
2. (a) Neglecting the effects of earth's magnetic field and the energy loss, show that the refractive index of the ionosphere is given by,

$$n = \sqrt{1 - \frac{80 \cdot 8 \, N}{f^2}},$$

where N = no. of electrons/cc.
f = frequency in kHz.

(b) From the above result, deduce Secant law.

(c) What do you mean by tropospheric waves?   6 + 2 + 2

3. (a) Describe the method of generation of DSB-SC signal by using balanced modulator. Draw the corresponding waveforms. Compare the relative merits and demerits of DSB-SC and DSB-TC signal.

(b) A 100 MHz carrier wave is frequency modulated, the modulation index being 5. The frequency of the information signal is 10 kHz. What is the maximum frequency deviation? What is the channel bandwidth? $(4 + 1 + 2) + 3$
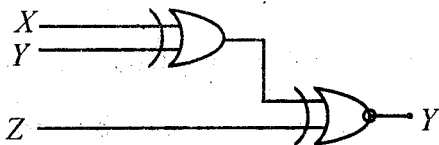
PAPER—PH- 1104 (B)

[*Marks* : 20]

Time : 1 hour

Answer **Q.No.1** and any *one* from the rest

1. Answer any *five* of the following questions : 2×5

(a) Give the truth table of the following circuit.

(*Continued*)

(b) What is the function of a decade counter ?

(c) You have a 2-bit parallel data. How can you transform it in serial form ?

(d) How many flip-flops are required to develop a (i) modulo 11 ripple counter and a (ii) modulo 6 ripple counter.

(e) In a digital circuit there are 3 inputs. One is control input. Output responds when control input and any one from the rest are high. Design the circuit.

(f) Realize the Boolean function using only NOR gates.

$$(A + B) + (A\bar{B})$$

(g) Identify the flip-flop.
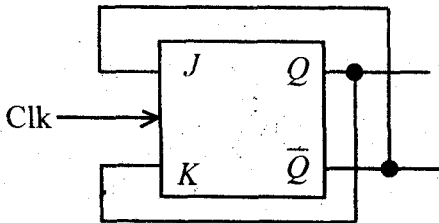
(h) What is astable multivibrator? Give one example of bi-stable multivibrator.

2. (a) Simplify the Boolean function by Karnaugh mapping

$$F(w, x, y, z) = \Sigma\ (0, 1, 2, 4, 5, 6, 8, 9, 12, 13, 14).$$

(b) Design a 3-bit synchronous counter.

(c) What is BCD number? What is the binary equivalent of $(59)_{BCD}$?

(d) Give the schematic idea of 7 segment display system. $3 + 3 + 2 + 2$

3. (a) Design a 3-bit bi-directional shift register.

(b) Discuss the principle of operation of the monostable multivibrator. Write also the expression of the time duration of the output.

(*Continued*)

(c). What will be the different output states of the following circuit?
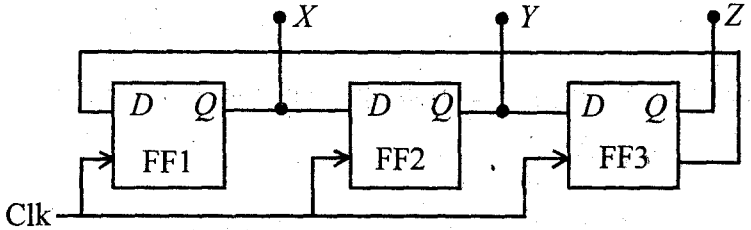
Assume the initial output state is 000.

(d) What are the uses of PISO register?   3 + 3 + 3 + 1

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