2015

M.Sc. 1st Seme. Examination

PHYSICS

PAPER—PHS-104

Full Marks : 40

Time : 2 Hours

The figures in the margin indicate full marks.

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

Illustrate the answers wherever necessary.

Use separate Answer-scripts for Group-A & Group-B

Group-A

[Marks : 20]

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

1. Answer any *five* questions : 5×2

(i) What are the advantages of n-channel MOSFETs over p-channel MOSFETs ?

(ii) Draw the circuit diagram of a current to voltage converter and what is its use.

(iii) Explain qualitatively why an antenna radiates electromagnetic signal.

(iv) How can the range of a radar be increased ?

(v) Explain the term 'skip distance' in radio wave communication.

(vi) A 450 kHz carrier signal is amplitude modulated by a 10 kHz audio signal. What is the frequency span of the generated AM signal and what is its band width ?

(vii) What do you mean by intermediate frequency (IF) signal ? What is the advantage of generating it in a radio receiver ?

2. (a) Write down the expression for a frequency modulated signal. Draw the circuit diagram of a FM modulator and explain its operation with derivation of the necessary theory. 1+1+3

(b) Draw the circuit diagram of a Foster-Seeley discriminator. Draw the equivalent circuit of the same and hence explain the operation of this discriminator. What is the advantage of this discriminator over other discriminators. 1+1+2+1

3. (a) What is the need of the fabrication of a constant current source at the input stage of an operational amplifier ? 2

(b) Explain the relative merits and demerits of generation of suppressed carrier signal over transmitted carrier signal. 2

(c) Explain how the distance of a fixed target can be found by using two frequency continuous wave radar. 4

(d) Explain the function of a duplexer in a radar system. 2

Group-B

[Marks : 20]

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

1. Answer any *five* questions : 5×2

(a) What is reflection code ?

(b) What is race around condition in J-K flip flop and how it can be removed ?

(c) What is the difference between astable and bistable multivibrator ?

(d) Convert the following function in standard POS form :

$$f(A, B, C) = AB + A\overline{B}C + A\overline{C}$$

(e) Convert R-S flip flop into D and T-type flip flop.

(f) Write the excitation table of J-K flip flop.

2. (a) Design an astable Multivibrator using 555 fimer having 75% duty cycle.

(b) Draw and explain the circuit operation of a bistable multivibrator using transistor. 5+5

3. (a) Design a 4 bit bidirection register circuit.

(b) Design a MOD-8 syndronus counter. 4+6