

2017**M.Sc.****1st Semester Examination****PHYSICS****PAPER—PHS-104****Subject Code—33****Full Marks : 40****Time : 2 Hours**

The figures in the right hand margin indicate full marks.

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

Illustrate the answers wherever necessary.

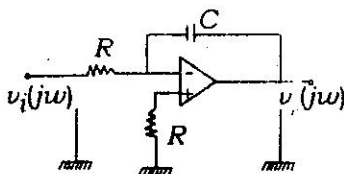
Use separate Answer-scripts for Group-A & Group-B

Group—A

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

1. Answer any five questions : 5×2

(a) Find $v_0(j\omega)$ in terms of $v_i(j\omega)$ for the following circuit



(Turn Over)

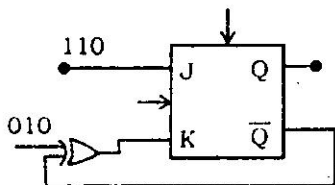
- (b) Draw the circuit diagram of a balanced modulator for production of DSB-SC signal.
- (c) What are the uses of constant current source in 741 op amp ?
- (d) Explain why the dimension of an antenna should be comparable to the wavelength of the signal to be transmitted for effective transmission.
- (e) Distinguish between space wave and ionospheric wave.
- (f) What are the differences between depletion MOSFET and enhancement MOSFET ?
- (g) What is the slew rate of an ideal op-Amp ? Why this value differs for the case of a practical op-Amp ?
2. (a) Define the terms critical frequency, MUF, skip distance in connection with ionospheric propagation. 3
- (b) Derive the expression for the refractive index of a homogeneous ionised gaseous medium when a radio wave propagation through it and find the expression for the critical frequency. Also derive the Secant law. What is its physical significance ? 4+1+1+1

3. (a) Define frequency modulation and derive the expression for an FM signal modulated by a sinusoidal information signal. 1+1
- (b) What is stereo FM system ? Describe the principle of design of transmitter and receiver for it. 4
- (c) Draw the circuit diagram of a Foster Scelely discriminator and explain its detailed operation as an FM demodulaor. 4

Group—B

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

1. Answer any *five* questions : 5×2
- (a) What is monostable multivibrator ? Give example.
- (b) Design the circuit for the following equation with NAND Gate only $Y = ABC + \bar{A}B$
- (c) Give the output states of the following FF



- (d) Use Karnaugh map to minimize the following logical expression.

$$F = AB\bar{C}D + \bar{A}BCD + \bar{A}\bar{B}CD + ABC\bar{D} + ABCD + \bar{A}\bar{B}\bar{C}\bar{D} + \bar{B}$$

- (e) Convert the following equation by POS form

$$F = ABC + A\bar{B}C + A\bar{B}\bar{C} + A\bar{B}\bar{C} + \bar{A}\bar{B}\bar{C} + ABC$$

- (f) Write the function of a 'Bidirectional Universal Register'.
- (g) What is synchronous counter? How it is advantageous?
2. (a) Draw the circuit diagram of a seven segment digital display based system for display of decimal numbers.
- (b) Discuss the principle of operation of transistor based monostable multivibrator. 5+5
3. (a) Design a 3 bit register which has both SISO and PISO mode with mode selector.
- (b) Construct 4-bit synchronous up counter. Give the state diagram of the counter.
- (c) Give the block diagram of twisted ring counter? 4+4+2