

## First Semester Examination-2017

M.Sc. PHYSICS

Paper Code: PHS-104

Full Marks : 40

Time: 2 Hours

Use Separate scripts for Group A &amp; Group B ✓

## Group A

(Analog Electronics-I)

Answer Question no 1 and any One from the rest.

1. Answer any five bits: 2 × 5
- (a) Define slew rate of an operational amplifier and discuss its importance.
- (b) Draw circuit diagram of voltage to current converter and what is its use.
- (c) What do you mean by pilot carrier?
- (d) Define skip distance in case radio wave propagation.
- (e) What do you mean by active load?
- (f) Explain the operation of a duplexer.
- (g) In integrated circuits, why the packing density of MOSFET is much more than that for BJT.
2. (a) Discuss with proper circuit diagram operation of collector modulator. 3
- (b) Describe with proper block diagram the principle of operation of super heterodyne receiver. 3
- (c) Draw circuit diagram of a Foster-Seeley discriminator. What is advantage of this discriminator over other discriminator? 1+1
- (d) State Carson's rule of thumb for the bandwidth of an FM and hence find out bandwidth of an FM signal whose modulation index is 6 and maximum modulating frequency is 9 kHz. 2
3. (a) What is a level shifter? How are they realized in an OP-Amp IC using voltage reference circuits and constant current sources? 3
- (b) Describe the technique adopted in 741 IC to remove the cross-over distortion. 3
- (c) Consider that  $Q_1$  and  $Q_2$  are silicon transistors and their current gains are equal. Find the ratio of  $I_o$  and  $I_i$  as shown in the figure. 4

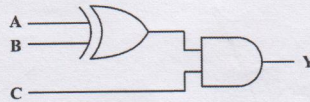


**Group B**

(Digital Electronics-I)

Answer Question no 1 and any One from the rest.

1. **Answer any five questions:** **2 × 5**
- (a) Convert J-K flip-flop into D and T- type flip-flop.
- (b) Convert following function in standard POS form:
- $$f(A, B, C) = AB + BC + AC$$
- (c) Represent the following function of X, Y, Z by karnaugh map:
- $$F(X, Y, Z) = XY + Z$$
- (d) What do you mean by Johnson counter?
- (e) Why an astablemultivibrator is called self-triggering circuit?
- (f) Design the 'Sum' output of a half adder circuit using NAND gates only.
- (g) Design the following circuit with NAND gate only.



2. (a) You have 6kHz signal. Design a circuit that produce 1 kHz signal at output. 5
- (b) Design a Monostablemultivibrator using 555 timer. 3
- (c) Draw circuit diagram of a R-S Flip Flop and briefly explain its operator. 2
3. (a) Draw Karnaugh Map for the following function of four variable and use them to reduce these function :  $F(A, B, C, D) = \sum m(1,4,6,9,11,15)$ . 4
- (b) Design 3-bit up/down asynchronas counter with a mode selector which can control the 'up' or down counter. 5
- (c) What is race around condition in JK Flip Flop? 1

