

8. (a) Simplify the following expressions : 9  
 (i)  $Y = (A + B)(A + C)(B + C)$   
 (ii)  $Y = AB + \overline{AC} + A\overline{BC}(AB + C)$   
 (b) Describe the steps required to measure voltage and frequency using CRO. 6

**(Compulsory Question)**

9. Attempt all questions :
- Why silicon and germanium are the two widely used semiconductor materials ?
  - What is the ratio of majority and minority carriers in intrinsic and extrinsic semiconductors ?
  - What precautions are required to be observed in the use of LEDs ?
  - Why does a pure semiconductor behave like an insulator at absolute zero temperature ?
  - What is static resistance of a diode ?
  - Why silicon type transistors are more often used than germanium type ?
  - Why is bleeder resistance employed in a filter circuit ?
  - What are the conditions for oscillation ?
  - Define positive logic and negative logic.
  - Define offset voltage and slew rate for op-amp.  $1.5 \times 10 = 15$

**Sep-21-00677**

**B. Tech. EXAMINATION, 2021**

Semester II (CBCS)

FUNDAMENTALS OF ELECTRONICS

ENGINEERING

EC-101

*Time : 2 Hours*

*Maximum Marks : 60*

*The candidates shall limit their answers precisely within 20 pages only (A4 size sheets/assignment sheets), no extra sheet allowed. The candidates should write only on one side of the page and the back side of the page should remain blank. Only blue ball pen is admissible.*

**Note :** Attempt *Four* questions in all, selecting *one* question from any of the Sections A, B, C and D. Q. No. 9 is compulsory. All questions carry equal marks.

**Section A**

- (a) Explain through energy diagram, the operation of pn junction under forward and reverse biased condition. 7.5

- (b) Give reasons of the following : **7.5**
- (i) Phototransistor needs no biasing
  - (ii) p-n junction photodiode is always used in reverse biased condition.

2. (a) Find the concentration of electrons and holes in a p-type silicon at 300°K by assuming resistivity as 0.02 Ω cm.

Assume  $\mu_p = 475 \text{ m}^2 \text{ (vsec)}^{-1}$  and  $n_i = 1.45 \times 10^{10} \text{ cm}^{-3}$ . **7.5**

- (b) For a full wave rectifier with a simple capacitor filter show that the ripple factor is

$$r = \frac{1}{4\sqrt{3}fCR_L} \cdot \quad \mathbf{7.5}$$

### Section B

3. (a) Draw and explain the input and output characteristics of transistor in CB configuration. **7.5**

- (b) Sketch the drain characteristics of a JFET and explain its before and after pinch off. **7.5**

4. A silicon transistor with  $\beta = 50$  is used in self biasing arrangement with  $V_{CC} = 20 \text{ V}$ ,  $R_C = 5 \text{ k}\Omega$ . The operating point Q is at  $V_{CE} = 11.5 \text{ V}$ ,  $I_C = 1.5 \text{ mA}$ . Find values of  $R_1$ ,  $R_2$  and  $R_E$ . **15**

### Section C

5. (a) Draw the neat diagram of Wein Bridge oscillator. Derive the expression for frequency of oscillation. **7.5**

- (b) Explain the operation of the following applications using Op-amp : **7.5**

- (i) Subtractor
- (ii) Averages.

6. (a) Explain, how will you improve ?

- (i) CMRR of differential amplifier
- (ii) Differential gain of differential amplifier.

**9**

- (b) Draw and explain the circuit of Hartley oscillator. **6**

### Section D

7. (a) Implement XNOR and NOR gates using NAND gates. **7.5**

- (b) Draw and explain the block diagram of CRO in detail. **7.5**