

- (iv) A free-running multivibrator starts with \_\_\_\_\_? (a trigger/ an external circuit/ an input signal / nothing)
- (v) If the comparator input is a sine wave, the output is \_\_\_\_\_ (rectangular wave/ sine wave / sawtooth wave / ramp wave)
- (vi) In an Op-amp, negative feedback \_\_\_\_\_ (increases the  $R_i$  and  $R_o$  increases  $R$  and BW, decreases  $R_o$  and BW, does not affect impedance and BW)
- (vii) A level shifter is used in the internal circuit of the Op-amp \_\_\_\_\_ (for adjustment of the DC voltage / to increase the internal impedance / to provide high gain / to decrease input resistance)
- (viii) In an op-amp the clipping level is determined by \_\_\_\_\_ (AC supply voltage / Control voltage / Reference voltage / Input voltage)
- (ix) The phase-locked loop tracks any change in input frequency in \_\_\_\_\_. (Free running state / Capture state / Phase locked state / All of the mentioned)
- (x) The period during which in a sample and hold circuit, the voltage across capacitor is equal to input voltage is \_\_\_\_\_. (Sample period / Hold period / Delay period / Charging period)

### GROUP B

Answer any SIX questions.

2. (a) Draw the block diagram of internal construction of op-amp, and explain the function of each block in detail. (8)
- (b) What is CMRR? Find an expression for it. How can we improve the CMRR? (7)

- (a) An inverting amplifier with  $R_1 = 20 \text{ K}\Omega$ ,  $R_2 = 10 \text{ K}\Omega$  and  $V_1 = 3 \text{ V}$  drives a  $2 \text{ K}\Omega$  load. Assume  $I_Q = 0.5 \text{ mA}$ , find  $i_{CC}$ ,  $i_{EE}$  and  $i_o$ .
- (b) Find the power dissipated inside the op-amp.
- (c) Explain the terms as applied to op-amp : Input offset voltage, Slew rate, PSRR.
- (d) What is a voltage follower? What are the advantages of a voltage follower circuit?
- (e) For a non inverting floating load V-I converter circuit with  $V_1 = 5 \text{ V}$ ,  $R = 10 \text{ K}\Omega$ ,  $V_{sat} = \pm 13 \text{ V}$ , and a resistive load  $R_L$ . For the circuit find the  $i_o$ , the voltage compliance and the maximum permissible value of  $R_L$ .
- (f) How offset voltage compensation can be done in practice?
- (g) For a V-I converter,  $V_{in} = 5 \text{ V}$ ,  $R = 10 \text{ K}\Omega$ ,  $V_1 = 1 \text{ V}$ , find the load current and output voltage  $V_o$ .

