

B.TECH.
(SEM I) THEORY EXAMINATION 2022-23
BASIC ELECTRONICS

Time: 3 Hours**Total Marks: 70****Note:** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 7 x 2 = 14

- (a) What you mean by Doping. Describe its need.
- (b) A silicon diode has a saturation current (I_s) of 5nA at 25°C. Find I_s at 100°C.
- (c) Determine β_{dc} and I_{CBO} , if $I_E = 5 \text{ mA}$, $I_C = 4.95 \text{ mA}$, $I_{CEO} = 200\mu\text{A}$.
- (d) Differentiate between Depletion and Enhancement type MOSFET.
- (e) Define Slew Rate and CMRR.
- (f) Give the need of triggering circuit in a CRO.
- (g) A 320W carrier is simultaneously modulated by two audio waves with modulation % of 45 and 60 respectively. What is the sideband power radiated.

SECTION B

2. Attempt any *three* of the following: 3 x 7 = 21

- (a) What is Diode. Draw & explain the V-I characteristic of a P-N junction diode. Also describe the effect of Temperature on the V-I characteristic of a P-N junction diode.
- (b) What is a Transistor. Describe the construction of a NPN transistor. Describe output characteristics for NPN transistor in CE configuration. Label all variables and also indicate the regions.
- (c) What is an Operational Amplifier. Describe its block diagram. Give its equivalent circuit and voltage transfer characteristics. List its characteristics.
- (d) What is Cathode Ray Oscilloscope. Describe its working with the help of block diagram.
- (e) Define Amplitude Modulation. Also derive power relation of AM wave.

SECTION C

3. Attempt any *one* part of the following: 1 x 7 = 7

- (a) What do you mean by a Rectifier. Compare different types of rectifier, giving their circuit.
- (b) For a Zener Voltage regulator, determine the range of R_L and I_L that will result in V_o being maintained at 10V. Given $V_{in} = 50\text{V}$, $R = 1\text{K}\Omega$, $I_{ZM} = 32\text{mA}$.

4. Attempt any *one* part of the following: 1 x 7 = 7

- (a) Describe the construction, working and characteristic of enhancement type MOSFET.
- (b) Define α and β with respect to BJT and derive the relationship between them. Explain the operation of voltage divider bias circuit and write down the approximate equations of V_B , I_E , I_C and V_{CE} .

5. Attempt any *one* part of the following: 1 x 7 = 7

- (a) Draw the circuit of Non-inverting amplifier using OP Amp and explain its working. Also obtain expression for its output.
- (b) Draw the circuit of Subtractor using OP Amp and explain its working. Also obtain expression for its output.

6. Attempt any *one* part of the following: 1 x 7 = 7

- (a) What is Digital Multimeter. Describe its working with the help of block diagram.
- (b) Describe Frequency & Phase measurement with the help of Lissajous Pattern using CRO.

7. Attempt any *one* part of the following: 1 x 7 = 7

- (a) Explain the elements of communication system with the help of block diagram.
- (b) An audio frequency signal $10 \sin 2\pi \times 500 t$ is used to amplitude modulate a carrier of $50 \sin 2\pi \times 10^5 t$. Calculate :
 - (i) Modulation Index
 - (ii) Sideband Frequency
 - (iii) Amplitude of each sideband
 - (iv) Bandwidth required
 - (v) Total power delivered to the load of $1 \text{ K } \Omega$
 - (vi) Transmission Efficiency