

## ECE 101

B. TECH. (II<sup>nd</sup> SEMESTER) EXAMINATION, 2025-26

BACHELOR OF TECHNOLOGY

(ME & CSE)

(Basic Electronics Engineering)

Time : Three Hours]

[Maximum Marks : 75

**Note:** There are **three** sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

### Section-A

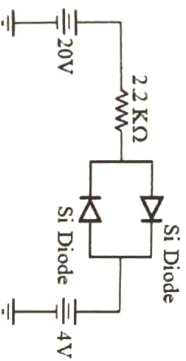
1. Attempt **all** parts of the following :  $5 \times 3 = 15$
- (a) Compare conductors, insulators and semiconductor material with the help of energy band diagram. What are n-type and p-type semiconductors ?
- (b) Differentiate between ideal and practical PN junction diode.
- (c) A JFET has a maximum drain current  $I_{DSS} = 10\text{mA}$  and pinch-off voltage  $V_P = -4\text{V}$ . Calculate the drain current  $I_D$  when the gate-to-source voltage  $V_{GS} = -2\text{V}$ .

- (d) List the ideal characteristics of an Op-Amp.
- (e) State the needs of modulation in communication system.

**Section-B**

**Note:** Answer all questions of the following:  $4 \times 5 = 20$

- 2. (a) Two diodes are connected in parallel with a  $2.2k\Omega$  resistor and battery as shown in figure. Find the current I through resistor.



**Or**

- (b) Explain transition and different capacitance in detail.
- (a) Discuss the common base current gain and common emitter current gain. Also derive the relationship between  $\alpha$ ,  $\beta$  and  $\gamma$ .

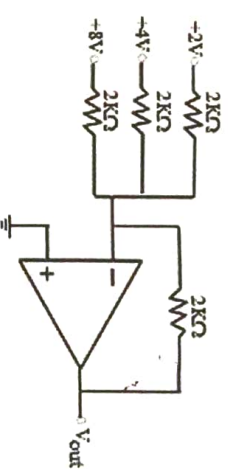
**Or**

- (b) Give the performance comparison of JFET and MOSFET. Why is FET a voltage controlled device?

- 4. (a) Design Op-Amp Integrator circuit. Also obtain its output voltage expression.

**Or**

- (b) Determine the output voltage for the given circuit.



**Or**

- 5. (a) Explain the principle of amplitude modulation.
- (b) The carrier power of an Am wave is 250W. If the total power transmitted is 312.5W. Calculate the modulation index.

**Section-C**

**Note:** Answer any two questions of the following:  $2 \times 20 = 40$

- 6. (a) Describe the construction, working and V-I characteristics of a PN junction diode.
- (b) Explain the working, circuit diagram and output waveform of a full-wave bridge rectifier. Also derive its  $V_{dc}$ ,  $V_{rms}$  and ripple factor.



7. (a) Discuss the input and output characteristics of a BJT in the common Base Configuration.
- (b) Explain the different breakdown mechanism in PN junction diode. Explain how a Zener diode can be used as a voltage regulator with a circuit diagram.
8. (a) Describe the basic structure of an n-channel MOSFET. Also draw its transfer and drain characteristics.
- (b) Derive and explain the working of inverting and non-inverting operational amplifier.
9. (a) Explain in detail the block diagram and working of Cathode Ray oscilloscope.
- (b) (i) Explain the working of summing amplifier.
- (ii) An Am signal has a total power of 180W and a modulation index of 0.5. Find the carrier power.



## ECE 101

B.Tech. II<sup>nd</sup> SEMESTER EXAMINATION, 2024-25

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[Maximum Marks : 75

Note: There are three sections (A, B and C) and candidate has to attempt questions from all sections. Marks are indicated against each section.

### Section-A

1. Attempt all parts of the following : 5×3=15
  - (a) What are n-type and p-type semiconductors? Illustrate your answer with energy band diagrams.
  - (b) Differentiate between half-wave and full-wave rectifiers.
  - (c) For an NPN transistor with  $\alpha = 0.95$ , calculate the value of  $\beta$ . If  $\beta$  becomes 100, determine the corresponding value of  $\alpha$ .
  - (d) Enlist the characteristics of an ideal Op-Amp.
  - (e) Draw the block diagram of communication systems.

### Section-B

Note : Answer all questions of the following :  $4 \times 5 = 20$

2. (a) Discuss the transition and diffusion capacitance of the junction diode.

OR

- (b) Compare Zener and Avalanche breakdown mechanisms.

3. (a) Derive the mathematical relationship between  $\alpha$  and  $\beta$  in a BJT.

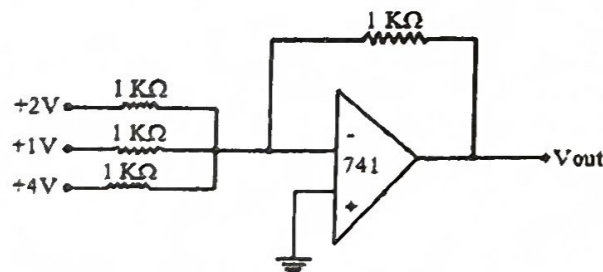
OR

- (b) What is a zener diode ? Explain its operation as voltage regulator circuit.

4. (a) Explain the inverting and non-inverting amplifier. Draw the circuit diagram and obtain the expression for output voltage.

OR

- (b) Determine the output voltage for the configuration as shown.



5. (a) Give a brief overview of various analog modulation techniques used in communication engineering.

OR

- (b) A 400 Watt carrier is modulated to a depth of 80%. Calculate the total power in this modulation process.

### Section-C

Note : Answer any two questions of the following :  $2 \times 20 = 40$

6. (a) Explain working principle of PN junction diodes. Include a diagram of its V-I characteristics.

- (b) What is LED ? Explain its working with neat diagram.

7. (a) Discuss the input and output characteristics of a BJT in the common Emitter Configuration.

- (b) Describe the basic structure of an n-channel JFET. What is pinch-off in JFET ?

8. (a) Derive the expression for output voltage for an integrator circuit.

- (b) Derive the expression for output voltage of Op-Amp as differentiator circuit.

9. (a) Explain the block diagram of CRO. Discuss how voltage and frequency are measured using it.
- (b) Explain need of modulation in communication. Calculate the modulation index and percentage modulation if voltages of modulating signal and carrier signal are 40 Volts & 50 Volts respectively.

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