Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem Examination Dec-2023

EC3CO03 Electronic Devices & Circuits

Programme: B.Tech. Branch/Specialisation: EC

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. In a semiconductor crystal, what happens to its conductivity as the temperature increases? **1**

(a) It decreases (b) It remains constant

(c) It increases (d) It depends on impurities

ii. What is the primary function of a Zener diode? **1**

(a) Amplifying signals (b) Regulating voltage

(c) Emitting light (d) Controlling current flow

iii. A common-base NPN transistor has a collector current (I_c) of 6 mA and an emitter current (I_e) of 7.2 mA. What is the base current (I_b) for this transistor? **1**

(a) 1.2 mA (b) 0.8 mA (c) 0.6 mA (d) 0.2 mA

iv. Which biasing method provides a stable Q-point? **1**

(a) Fixed bias (b) Collector feedback bias

(c) Voltage divider bias (d) Emitter bias

v. In an N-channel FET, which terminal controls the flow of current between the source and drain? **1**

(a) Gate (b) Drain (c) Source (d) Substrate

vi. Which type of MOSFET can be turned ON with zero gate-source voltage? **1**

(a) Enhancement-mode MOSFET (b) Depletion-mode MOSFET

(c) P-channel MOSFET (d) N-channel MOSFET

vii. In a Class A power amplifier, what is the conduction angle of the transistor? **1**

(a) 0 degrees (b) 45 degrees (c) 90 degrees (d) 180 degrees

P.T.O.

viii. According to the Barkhausen criteria, what is the first condition for oscillation in an amplifier circuit? **1**
(a) Positive feedback (b) Unity gain
(c) Low distortion (d) High voltage gain

ix. An amplifier has an open-loop gain (A) of 100. If it uses negative feedback with a feedback factor (β) of 0.1, what is the closed-loop gain (Af) of the amplifier? **1**
(a) 10 (b) 100 (c) 1000 (d) 110

x. A Wien bridge oscillator uses an RC network with R = 10 kΩ and C = 100 nF. What is the oscillation frequency (f) of this oscillator? **1**
(a) 1 kHz (b) 10 kHz (c) 100 Hz (d) 10 Hz

Q.2 i. Describe the difference between n-type and p-type semiconductor materials. **2**

ii. Draw and explain the V-I Characteristics of PN Junction diode. **3**

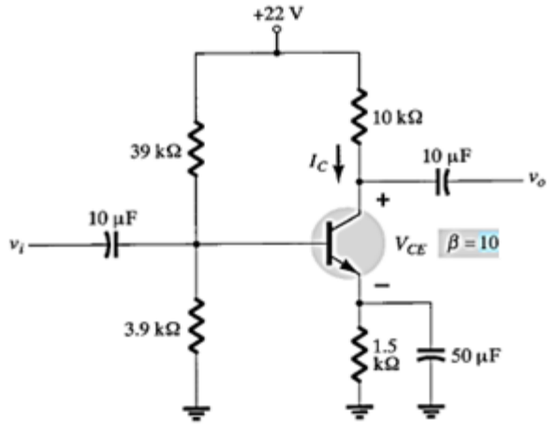
iii. Discuss the application of Zener diodes as voltage regulators. Explain how a Zener diode, in combination with a series resistor, can be used to maintain a stable output voltage. **5**

OR iv. Explain the operation of varactor diodes and their use as voltage-variable capacitors. How do the capacitance and reverse bias voltage relate in Varactor diodes? **5**

Q.3 i. Explain the importance of biasing in BJT amplifiers. **2**

ii. Explain the operation of Common Emitter (CE) configurations with the input and output characteristic. **8**

OR iii. Determine the dc bias voltage V_{CE} and the current I_C for the voltage-divider configuration of the given figure. **8**



Q.4 i. Explain the fundamental difference between FET and BJT. **3**

ii. Compare the operation of N-channel and P-channel FETs. How do these types of FETs differ in terms of voltage polarity and current flow? **7**

OR iii. Describe the operation of Enhancement-Mode and Depletion-Mode MOSFETs. How do these two modes of operation differ in terms of the control of the channel current? **7**

Q.5 i. Describe the Barkhausen Criteria for oscillation. What are the two conditions that must be met for sustained oscillations to occur in a circuit? **4**

ii. Compare Class A and Class B amplifiers that use BJTs. How do they differ in terms of operating conditions and efficiency? What are their respective advantages and drawbacks? **6**

OR iii. Explain the operation of voltage amplifier and current amplifier. **6**

Q.6 Attempt any two:

i. Explain the concept of voltage series feedback in amplifiers. How does it affect voltage gain and input/output impedance? What are the advantages and disadvantages of this topology? **5**

ii. Write Short Notes on RC-phase shift oscillator. **5**

iii. Compare negative feedback and positive feedback. How do they differ in terms of their effects on gain, bandwidth, distortion, and stability? **5**

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