

N.B.

1. Attempt all questions.

2. Figures to the Right Indicate Full Marks

3. Assume Suitable Data If Necessary and State It Clearly

4. Use of Non-Programmable Calculator and Data Sheet is allowed

Q.1. Define the Following

- a) Negative and positive feedback amplifier
- b) Pinch off voltage
- c) Avalanche breakdown and Zener breakdown
- d) Transistor stability factor

CO1 (4*1M)=4M

Q.2. Attempt any three of the following

- a) Draw the common emitter circuit and the approximate h-parameter model.
- b) State the difference between Static and dynamic resistances of a p - n diode.
- c) List the advantages and disadvantages of FET over MOSFET
- d) Draw the feedback topology block diagram and equivalent circuit for voltage-series.

CO1 (3*2M)=6M

Q.3. Choose the correct alternative for the following

- a) A resistor with color bands Red, Violet, Green and Black will have a value
 - (A) 27 K \pm 10% K
 - (B) 2.7 M \pm 20% K
 - (C) 270 K \pm 5% K
 - (D) 2.7 K \pm 2% K
- b) An intrinsic semiconductor at the absolute zero temperature
 - (A) behaves like a metallic conductor
 - (B) behaves like an insulator
 - (C) has a large number of holes
 - (D) has a large number of electrons
- c) Which configuration has unity voltage gain (ideal)
 - (A) a Common Collector (CC)
 - (B) a Common Emitter (CE)
 - (C) a Common Base (CB)

CO1 (8*1M)=8M

Q.6 Attempt any four of the following (4*3M)=12M CO2

a) What is the ripple factor if a power supply of 220 V, 50 Hz is to be Full Wave rectified and filtered with a 220µF capacitor before delivering to a resistive load of 120Ω? Compute the value of the

Q.5 Attempt any three of the following (3*4M)=12M CO2

a) Can the value of stability factor be less than unity? Briefly explain.
 b) Discuss how to determine h-parameters from transistor characteristics.
 c) Draw and explain the circuit diagram of Class-C Power Amplifiers.
 d) What is oscillator circuit? Write types of it and explain any one of it?

Q.4. Attempt any three of the following (3*4M)=12M CO2

a) Show that the junction resistance for a silicon or germanium diode is given by the equation $r_j = 26/I_f$ where I_f is diode current
 b) Why the base of transistor is made thin and is lightly doped?
 c) Compare Enhancement MOSFET and depletion MOSFET.
 d) Why do we need filters? Under what conditions capacitor filter is used.

Q.7 Attempt any one of the following (1*6M)=6M CO3

a) Design a collector to base bias circuit using silicon transistor to achieve a stability factor of 20, with the following specifications: $V_{CC} = 16V$, $V_{BE} = 0.7V$, $V_{CEQ} = 8V$, $I_{CQ} = 4\text{ mA}$ & $\beta = 50$.
 b) A 230 V, 60Hz voltage is applied to the primary of a 5:1 step down, center tapped transformer used in a full wave rectifier having a load of 900Ω. If the diode resistance and the secondary coil resistance together have a resistance of 100 Ω, determine i) DC voltage across the load, ii) DC current flowing through the load, iii) DC power delivered to the load. iv) PIV across each diode.

Q.8 Attempt any one of the following (1*6M)=6M CO3

a) Calculate the values of I_c and I_E for a transistor with $\alpha_{dc} = 0.99$ and $I_{CBO} = 5\mu A$, if I_B is measured as 20µA.
 c) Find the Q-point of self-bias transistor circuit with the following specifications: $V_{CC} = 22.5V$, $R_L = 5.6k\Omega$, $R_C = 1k\Omega$, $R_1 = 90k\Omega$, $R_2 = 10k\Omega$, $V_{BE} = 0.7V$ and $\beta = 55$. Assume $I_B \gg I_{CO}$.
 d) The source and load resistances connected to a BJT amplifier in CE configuration are 680Ω and 1 KΩ respectively. Calculate the voltage gain A_v and the input resistance R_i if the h-parameters are listed as $h_{ie} = 1.1\text{ k}\Omega$; $h_{re} = 2 \times 10^{-4}$; $h_{fe} = 50$ and $h_{oe} = 20\mu\text{mhos}$.
 e) The diode current is 0.8mA at $V = 340\text{mV}$ and 15mA at $V = 440\text{mV}$. Determine the value of η .

Q.9 Attempt any one of the following (1*6M)=6M CO3

a) JFET is a
 (D) CE followed by CB
 (A) Current controlled device with high input resistance
 (B) Voltage controlled device with high input resistance
 (C) Current Controlled Current Source (CCCS)
 (D) Voltage Controlled Voltage Source (VCVS)
 e) The load line is defined by the _____ and a characteristic curve is defined by the _____.
 (A) quiescent point, device
 (B) device, network
 (C) network, device
 (D) None of the above
 f) An amplifier is stable if the absolute magnitude of βA is _____.
 (A) ∞
 (B) Less than 1
 (C) Greater than 1
 (D) None of the above
 g) A feedback amplifier has a _____ upper 3-dB frequency and a _____ lower 3-dB frequency compared to an amplifier without feedback.
 (A) Smaller, higher
 (B) Higher, smaller
 (C) Smaller, smaller
 (D) Higher, higher
 h) For a phase-shift oscillator, the gain of the amplifier stage must be greater than _____.
 (A) 19
 (B) 29
 (C) 30
 (D) 1