[3 Hours]   **[Total Marks: 80]**

Instructions:
1. Question No.1 is compulsory.
2. Attempt any three from the rest.
3. Figure to the right indicates full marks.
4. Assume suitable data if it is necessary.

1   **(5 x 4)**
- a) Explain the need of biasing in BJT amplifiers.
- b) Interpret the drain-source characteristics of n-channel depletion type MOSFET for $V_{GS} = 0V$ and $V_{GS} = -2$ V.
- c) Explain diode as positive shunt clipper.
- d) Demonstrate the block diagram of op-amp with the function of each block.

2 a) Briefly discuss the different biasing techniques employed in BJT Amplifiers. **(10)**
    b) Draw the hybrid equivalent model of voltage divider bias CE amplifier and derive the expression for voltage gain. **(10)**

3 a) Draw the small signal equivalent circuit of an n-channel MOSFET amplifier derive the expression of voltage gain. **(10)**
    b) Determine the values of I_{DQ} and V_{GSQ} for the Common Source n-channel Depletion type MOSFET in voltage divider bias configuration. $R_{G1} = 91M\Omega$, $R_{G2} = 15M\Omega$, $R_D = 6.8K\Omega$, $R_S = 3.3K\Omega$, $V_{DD} = 18V$, $I_{DSS} = 12mA$, $V_P = -3V$. **(10)**

4 a) Explain op-amp as an inverting amplifier and design an inverting amplifier for voltage gain of -10. **(10)**
    b) Explain the working of astable multivibrator using IC 555. **(10)**

5 a) Explain the construction and working of optoisolators. **(10)**
    b) Explain op-amp as voltage summing amplifier and derive the expression of output voltage. **(10)**

6   Write short notes on **ANY TWO** **(20)**
- a) Monostable Multivibrator using IC555
- b) Op-amp as Integrator
- c) LM317 as Adjustable voltage Regulator