Duration: 3hrs **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any FOUR **[20]**

a Explain the forward bias mode of operation of the P-N junction diode with neat sketch.
b Explain the operation of the light emitting diode (LED) with neat sketch.
c Compare or differentiate between clipper & clamper circuits.
d Derive an expression for the ripple factor (γ) of a full wave bridge type rectifier.
e Explain the operation of capacitor (C) type filter with neat sketch.

2 a Describe the working or operation of a bridge type full wave rectifier with a neat sketch. Draw the input voltage & output voltage waveforms. **[10]**
b With a neat sketch, explain the Zener diode as a voltage regulator. Describe its operation for both, varying load resistance with a constant DC supply voltage & a varying DC supply voltage with a constant load resistance. **[10]**

3 a With appropriate mathematical analysis, explain the effect of temperature on the P-N junction diode V-I characteristics. **[10]**
b Explain with the help of neat diagram explain the working of combinational clipper circuit using appropriate waveforms. **[10]**

4 a Describe the V-I & transfer characteristics of N-channel junction field effect transistor (JFET). **[10]**
b What are memristors ? Explain the operating principle, construction & working of memristors with a neat sketch. **[10]**

5 a With a neat sketch, write a short note on solar cell describing its structure or construction, working & V-I characteristics. **[10]**
b Draw circuit diagram and explain the operation of different biasing circuits used for E-MOSFET. **[10]**

6 a Explain construction and working principle of Single Electron Transistor. **[10]**
b Draw all the different biasing circuits of BJT. Derive the expression of stability factor (S_I) for the voltage divider biasing circuit. **[10]**