2063
B.E. (Electrical and Electronics Engineering)
Third Semester
PC-EE-303: Analog Electronics

Time allowed: 3 Hours   **Max. Marks: 50**

*NOTE: Attempt **five** questions in all, including Question No. I which is compulsory and selecting two questions from each Part. All questions carry equal marks.*

x-x-x

Q1. **(a)** Can the channel of JFET completely closes at the drain end? Justify your answer.

(b) What is the effect of variation in power supply on the offset voltage? How this effect can be compensated?

(c) What is the potential barrier in a diode? How it gets established?

(d) Why is Schottky diode called a hot carrier diode?

(e) Differentiate between slew rate and transient response.

PART-A

Q2. (a) Can a transistor be constructed by simply connecting two separate diodes back to back. In a transistor explain, why emitter region is heavily doped, base width is small and collector area is large?

(b) Define stability factor w.r.t transistor biasing. Draw the biasing circuit in case of fixed bias with resistor R_E in series with emitter and reference ground. Derive expression for stability factor S in terms of the device parameters and circuit components for the mentioned biasing circuit.

Q3. (a) What are the advantages of FET over a conventional bipolar junction transistor? Define Pinch-off voltage, amplification factor and drain resistance of FET. Explain with the help of circuit diagram, how an FET is used as a voltage dependent resistor.

(b) What are the two types of capacitance across PN junction? Derive the relationship between transition capacitance and reverse bias potential. Also plot the graph between bias potential and capacitance.

Q4. (a) A bridge rectifier is supplying a load of 200mA at 30V. It uses a Π- section filter with the choke of 0.5H and two capacitors each of 80µF. Assume supply frequency of 50 Hz. Find (I) the input rms voltage of the secondary of the transformer and (ii) the percentage ripple in the output.

(b) What is the difference between the construction of enhancement type MOSFET and a depletion type MOSFET? Explain the operation and characteristics of N-channel MOSFET in depletion mode. Also sketch the transfer characteristics of N-channel depletion type MOSFET with $I_{DSS} = 10mA$ and $V_p = -4V$.

P.T.O.

PART-B

Q5. (a) Analyse the operation of true differentiator circuit and discuss the difficulties with high frequency noise. Draw the frequency response of basic and practical differentiator circuit.

(b) What is the difference between clippers and clampers? Design two positive clipper circuits for reference voltages +1V and -1V respectively and show its input and output voltage waveforms.

Q6. (a) Design a narrow band pass filter so that $f_c = 2KHz$, $Q = 20$, $A_F = 10$.

(b) Draw the circuit diagram of class B push pull amplifier and explain its operation. Derive an expression for its maximum conversion efficiency.

Q7. (a) Design a circuit that will permit the phase shift to be adjustable over the range of atleast from +45° to +135° at a frequency of 1KHz using a 10 KΩ potentiometer.

(b) Define input offset voltage and explain why it exists in all op-amps. Why is it necessary to use an external offset voltage-compensated network with practical op-amp circuits.

x-x-x