2021

COMPUTER SCIENCE — HONOURS

Paper : CC-4

(Basic Electronic Devices and Circuits)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer ***question No. 1*** and ***any four*** from the rest.

1. Answer ***any five*** questions: 2×5

(a) What is the difference between Avalanche breakdown and Zener breakdown of a $p-n$ junction?

(b) State the function of the depletion region of a $p-n$ junction diode.

(c) Explain the term 'peak inverse voltage'.

(d) State how FET can be used as VVR.

(e) State the relation between α and β of a transistor.

(f) Differentiate static and dynamic MOS cell.

(g) What CMRR of an OPAMP?

(h) What is the difference between 'Enhancement' type and 'Depletion' type MOSFET?

2. (a) State and explain Norton's theorem.

(b) Define the cut-in voltage of a $p-n$ junction diode. What are its typical values for Ge and Si diodes?

(c) Draw the circuit diagrams of a forward-biased and reverse-biased $p-n$ junction diode. Draw the characteristics and explain it. 3+2+5

3. (a) What is the quiescent point of a transistor?

(b) Draw the circuit diagram of a C-E transistor amplifier and explain its operation graphically.

(c) What is a load line? Explain its significance. 2+6+2

4. (a) Why a field-effect transistor is called a unipolar device?

(b) With a neat sketch, describe the construction of an n-channel JFET. Explain its operation.

(c) Explain the drain characteristics of an n-channel JFET. What is the transfer characteristic? 1+4+5

5. (a) What should be the input resistance, output resistance voltage gain and bandwidth of an OPAMP?

(b) How an OPAMP can be used as a current to voltage converter? 6+4

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6. (a) Explain with a neat circuit the operation of a monostable multivibrator.

(b) How can you convert the monostable multivibrator to an astable multivibrator? 5+5

7. (a) Explain the voltage divider transistor biasing circuit and derive the expression for output voltage (V_{CE}) and input current (I_B).

(b) Draw the circuit diagram of a CMOS NOT gate and briefly explain its operation. 6+4

8. (a) Explain the working of R-2R ladder network as Digital to Analog Converter (DAC) with appropriate circuit diagram.

(b) Show the efficiency of a full wave rectifier is more than 80%. 6+4

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