

M.Sc. ELECTRONICS
First Semester
Analog Electronic Devices and Circuits
(MSE - 03)

Duration: 3Hrs.

Full Marks: 70

Part-A (Objective) =20
Part-B (Descriptive)=50

(PART-B: Descriptive)

Duration: 2 hrs. 40 mins.

Marks: 50

1. Answer the following questions in brief (any five)

2×5=10

- a) What is a semiconductor material? How does it differ from a conductor?
- b) Define forward and reverse biased of a p-n junction diode.
- c) What is Zener breakdown?
- d) Name the three possible transistor connections.
- e) What do you mean by d.c and a.c load line?
- f) Define CMRR and bandwidth of an OPAMP.
- g) What do you mean by positive and negative feedback?

2. Answer the following questions (any five)

3×5=15

- a) Define ohmic contact and rectifying contact.
- b) What do you mean by Schottky diode?
- c) Define α of a transistor amplifier. Show that it is always less than unity.
- d) State the Piezoelectric effect.
- e) What do you mean by tunnel diode?
- f) What is an ideal OPAMP?
- g) Distinguish between Passive & Active filters.

3. Answer the following questions (any five)

5×5=25

- a) Explain the operation of MOSFET with neat diagram.
- b) Draw the hybrid equivalent circuit of a BJT in CE configuration and explain the physical meaning of different h- parameters used in the circuit.
- c) Discuss the superiority of FETs over BJTs.
- d) Draw the circuit of an OPAMP as an integrator and explain its operation.
- e) Describe the physical mechanism of Zener breakdown. Draw a circuit which uses Zener diode to regulate the voltage across the load.
- f) What do you mean by Multivibrator? Classify different types of multivibrator. Explain the operation of Bistable multivibrator.
- g) What is a feedback circuit? Explain how it provides feedback in amplifiers?

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(The figures in the margin indicate full marks for the questions)

Duration: 20 minutes

Marks – 20

PART A- Objective Type

I. Choose the correct options:

1 × 20 = 20

1. Light falls on one end of a long open-circuited n-type semiconductor bar for low level Injection the hole current is predominantly to:
(A) Drift (B) Diffusion
(C) Both drift and diffusion (D) Length of bar
2. The action of JFET in its equivalent circuit can be represented by:
(A) Current controlled current source
(B) Current controlled voltage source
(C) Voltage controlled current source
(D) Voltage controlled voltage source
3. The value collector current I_C of a BJT is 1mA. If $\beta = 50$, then the value of I_B is
(a) 20 μ A (b) 0.02 μ A (c) 0.2mA (d) 2 nA
4. The voltage divider bias circuit is used in amplifier quite often because it
(a) limits the voltage gain
(b) makes the operating point almost independent of β
(c) reduces the dc bias current
(d) reduces the cost of the circuit.
5. CMRR (Common Mode Rejection Ratio) for a differential amplifier should be:
(A) Zero (B) Unity
(C) Small (D) Large

6. Under high electric fields, in a semiconductor with increasing electric field:

- (A) The mobility of charge carriers decreases and saturates
- (B) The mobility of charge carriers increases.
- (C) The Velocity of charge carrier increases.
- (D) None of the above.

7. A Zener diode works on the principle of:

- (A) Tunneling of charge carriers across the junction
- (B) Thermionic emission
- (C) Diffusion of charge carriers across the junction
- (D) Hopping of charge carriers across the junction

8. The threshold voltage of an n-channel MOSFET can be increased by:

- (A) Increasing the channel dopant concentration
- (B) Decreasing the channel dopant concentration
- (C) Reducing the gate oxide thickness
- (D) Reducing the channel length

The temperature coefficient of an extrinsic semiconductor is....

- (A) Zero
- (B) Positive
- (C) Negative
- (D) None of the above

10. An intrinsic semiconductor at absolute zero...

- (A) Becomes extrinsic semiconductor
- (B) Behaves like an insulator
- (C) Disintegrates into pieces
- (D) Becomes superconductor

11. has the highest mobility.

- (A) Electron
- (B) Positive ions
- (C) Negative ions
- (D) Neutron

12. Which of the following acceptor impurities is generally used for silicon?

- (A) Gallium
- (B) Indium
- (C) Boron
- (D) None of the above

13. For a silicon P-N junction, the barrier potential is about

- (A) 0.7 V
- (B) 0.8 V
- (C) 0.9 V
- (D) 1.0 V

14. A Zener diode is invariably used with
- (A) Reverse biased
 - (B) Forward biased
 - (C) Zero biased
 - (D) Any of the above
15. The configuration in which input impedance of transistor amplifier is highest is
- (A) Common base
 - (B) Common collector
 - (C) Common emitter
 - (D) None of the above
16. An oscillator produces oscillations due to
- (A) Positive feedback
 - (B) Negative feedback
 - (C) Partly positive and partly negative
 - (D) Neither positive nor negative
17. FETs have similar properties to
- (A) Thermionic valves
 - (B) P-N-P transistor
 - (C) N-P-N transistor
 - (D) Uni-junction transistor
18. Class A amplifier is used when
- (A) Minimum distortion is desired
 - (B) D.C. voltage are to be amplified
 - (C) No phase inversion is required
 - (D) Highest voltage gain is required
19. The main use of a Class-C amplifier is
- (A) As distortion generator
 - (B) As stereo amplifier
 - (C) As an R.F. amplifier
 - (D) None of the above
20. In which of the following are high input impedance, low output impedance and high voltage gain obtainable?
- (A) Operational Amplifier
 - (B) Common collector amplifier
 - (C) RC amplifier
 - (D) Common emitter amplifier
