

**B.Sc. Electronics**  
**Second Semester**  
**Semi Conductor Devices and Circuits**  
**(BSE- 08)**

**Duration: 3Hrs.**

**Full Marks: 70**

**PART A (Objective) =20**

**PART-B (Descriptive)=50**

**PART-B (Descriptive)**

**Duration: 2 hrs. 40 mins.**

**Marks: 50**

**I. Answer the following (any five)**

**5×5=25**

- Explain the current components of transistor for common base configuration. Write the generalized transistor equation.
- Derive the expression for electrostatic potential difference at thermal equilibrium for P-N junction.
- Explain the construction and operation of Silicon Controlled Rectifier (SCR).
- Describe the operation of Unijunction Transistor (UJT).
- What is FET? Explain the theory of operation of FET.
- Explain the JFET drain characteristics with  $V_{GS} = 0$ .
- Explain how Wafers are prepared in IC fabrication.

**II. Answer the following (any five)**

**5×3=15**

- Show the energy band diagram of extrinsic semiconductor at thermal equilibrium.
- Define average value, r.m.s. value, efficiency, ripples factor and peak inverse value of a rectifier.
- Explain the process of diffusion in IC fabrication.
- Write short notes on effective mass of an electron.
- What is break down device? Write the different applications of UJT.
- Find the value for ripple factor for half wave rectifier.
- What is MOSFET? Draw the construction of different MOSFETs.

**III. Answer the following (any five)**

**5×2=10**

- a) Write down the basic fabrication steps involved in IC fabrication.
- b) Which material is used for interconnection of IC? Explain the reason.
- c) Explain in brief operation and construction of DEMOSFET.
- d) Draw the two transistor model of SCR and its characteristic curve.
- e) Draw the DC and AC equivalent circuit of common base configuration of transistor.
- f) What are the applications of SCR?
- g) Define mobility and drift velocity.

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**Duration: 20 minutes**

**Marks – 20**

**PART A (Objective)**

**Time: 20 mins**

**Total Marks: 20**

**I. Choose the correct answer:**

**1×20=20**

1. Semiconductor materials have ..... bonds.  
a) Ionic                      b) Covalent                      c) Mutual                      d) Metallic
2. When a P-N junction is formed, diffusion current causes  
a) Mixing of current carriers                      b) Forward bias  
c) Reverse bias                      d) Barrier potential
3. The area within a semiconductor diode where no mobile current exist when it is formed is called ..... regions  
a) Depletion                      b) Saturation  
c) Potential barrier                      d) Space charge
4. Junction breakdown occurs  
a) Under high temperature condition  
b) With forward bias  
c) Under reverse bias condition  
d) Because of manufacturing defects.
5. The ripple factor of a power supply is given by (symbol have the usual meaning)  
a)  $\frac{P_{dc}}{P_{ac}}$                       b)  $\sqrt{\frac{I_{rms}}{I_{dc}} - 1}$                       c)  $\sqrt{\frac{I_{dc}}{I_{rms}} - 1}$                       d)  $\frac{I_{dc}}{I_{rms}}$
6. The primary function of a rectifier filter is to  
a) Minimise ac input variation  
b) Suppress odd harmonics in the rectifier output  
c) Stabilise dc level of the output voltage  
d) Remove ripples from the rectified output

7. In the case of bipolar transistor,  $\alpha$  is
- Positive and  $> 1$
  - Positive and  $< 1$
  - Negative and  $> 1$
  - Negative and  $< 1$
8. Which of the following approximations is often used in electronic circuits?
- $I_C \cong I_E$
  - $I_B \cong I_C$
  - $I_B \cong I_E$
  - $I_E \cong I_B + I_C$
9. FET consists of a
- Source
  - Drain
  - Gate
  - All of the above
10. In JFET, the drain current is maximum when  $V_{GS}$  is
- zero
  - negative
  - positive
  - equal to  $V_P$
10. A JFET can be cut-off with the help of
- $V_{GS}$
  - $V_{DS}$
  - $V_{DG}$
  - $V_{DD}$
11. The transconductance ' $g_m$ ' of a JFET is equal to
- $-\frac{2I_{DSC}}{V_P}$
  - $\frac{2}{|V_P|} \sqrt{I_{DSS} I_D}$
  - $-\frac{2I_{DSS}}{V_P} \left(1 - \frac{V_{GS}}{V_P}\right)$
  - $\frac{I_{DSS}}{V_P} \left(1 - \frac{V_{GS}}{V_P}\right)$
12. Which semiconductor device acts like a diode and two resistors?
- SCR
  - Triac
  - Diac
  - UJT
13. SCR turns OFF from conducting state to blocking state on
- Reducing gate current
  - Reversing gate voltage
  - Reducing anode current below holding current
  - Applying ac to the gate
14. An integrated electronic circuit is
- A complicated circuit
  - An integrated device
  - Much costlier than a single transistor
  - Fabricated on a tiny silicon chip
15. In monolithic ICs, all components are fabricated by.....
- Evaporation
  - Sputtering
  - Diffusion
  - Oxidisation

16. In an integrated circuit, the  $\text{SiO}_2$  layer provides
- a) Electrical connection to the external circuits
  - b) Physical strength
  - c) Isolation
  - d) Conducting path
17. The foundation on which an IC is built is called an
- a) Insulator
  - b) Base
  - c) Wafer
  - d) Plate
18. The minimum value of current required to maintain conduction in an SCR is called its.....
- a) Commutation
  - b) Holding
  - c) Gate trigger
  - d) Break over
19. The main factor which differentiates DEMOSFET from an E- only MOSFET is the absence of
- a) Insulated gate
  - b) Electrons
  - c) Channel
  - d) P-N junctions.
20. In a properly connected BJT, an increase in base current causes increase in
- a)  $I_C$  only
  - b)  $I_E$  only
  - c) Both  $I_C$  and  $I_E$
  - d) Leakage current

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