



**BRAINWARE UNIVERSITY**  
**Term End Examination 2020 - 21**

Programme – Bachelor of Technology in Electronics & Communication Engineering

Course Name – Electronic Devices

Course Code - PCC-EC301

Semester / Year - Semester III

Time allotted : 85 Minutes

Full Marks : 70

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

**Group-A**

(Multiple Choice Type Question)

1 x 70=70

1. (Answer any Seventy )

(i) A p-n junction diode's dynamic conductance is directly proportional to

- |                        |                    |
|------------------------|--------------------|
| a) The applied voltage | b) The temperature |
| c) Its current         | d) None of these   |

(ii) The band gap of semiconductor lies in the range

- |                   |                     |
|-------------------|---------------------|
| a) 5 to 10 eV     | b) 0.2 to 2.5 eV    |
| c) 0.01 to 0.1 eV | d) 0.001 to 0.09 eV |

(iii) The depletion layer width of a p-n diode is about

- |           |           |
|-----------|-----------|
| a) 0.5 cm | b) 0.5 mm |
| c)        | d) 0.5 nm |

**0.5  $\mu$ m**

(iv)

For a p-n-p transistor in CE mode,  $\beta=100$ , then the value of  $\alpha$  of the transistor is

- |         |          |
|---------|----------|
| a) 0.99 | b) 0.099 |
| c) 9.9  | d) 99    |

(v) The intrinsic carrier concentration of a semiconductor at 0 K is

- a) Zero
- b) Infinity
- c)  $10^{10} \text{ m}^{-3}$
- d)  $10^{15} \text{ m}^{-3}$

(vi) The junction capacitance of a p-n diode is used in

- a) Varactor diode
- b) Photo diode
- c) Zener diode
- d) Tunnel diode

(vii) The doping of the emitter region of a transistor is

- a) Larger than that of collector region
- b) Less than that of collector region
- c) Equal to that of collector region
- d) None of these

(viii) In the saturation region of a transistor operating in CE mode

- a) Emitter junction is forward biased and collector junction is reverse biased
- b) Both emitter and collector junctions are reverse biased
- c) Both emitter and collector junctions are forward biased
- d) None of these

(ix) In active region of a transistor

- a) Both emitter and collector junctions are reverse biased
- b) Both emitter and collector junctions are reverse biased
- c) Emitter junction is forward biased and collector junction is reverse biased
- d) None of these

(x) FET is advantageous over BJT since it is

- a) Thermally more stable
- b) It use one p-n junction
- c) It is a voltage controlled device
- d) None of these

(xi) Consider the following statements related to CMOS (Complementary metal oxide semiconductor) inverter: 1. It combines an n-channel and a p-channel MOS transistor. 2. For binary 1 input, both transistors are OFF. 3. For binary 0 input, both transistors are ON. 4. Whatever is the state of input, one transistor is

ON while the other is OFF. Which of the statements given above are correct?

- a) 1,2,3 and 4
- b) 1 and 4
- c) 1,2 and 3
- d) 3 and 4

(xii) In the context of IC fabrication, metallization means

- a) Connecting metallic wires
- b) Formation of interconnecting conduction pattern and bonding pads
- c) Doping SiO<sub>2</sub> layer
- d) None of these

(xiii) In an integrated circuit, the SiO<sub>2</sub> layer provides

- a) Electrical connection to external circuit.
- b) Physical strength
- c) Isolation
- d) Conducting path

(xiv) How many junctions do a diode consist?

- a) 0
- b) 1
- c) 2
- d) 3

(xv) During reverse bias, a small current develops which is known as

- a) Forward current
- b) Reverse current
- c) Reverse saturation current
- d) Active current

(xvi) When a forward biased is applied to a diode, the electrons enter to which region of the diode?

- a) P-region
- b) N-region
- c) P-n junction
- d) Metal side

(xvii) The current in the diode is contributed by

- a) Majority carriers only
- b) Minority carriers only
- c) Both majority and minority carriers
- d) None of these

(xviii) Zener diodes are also known as

- a) Voltage regulators
- b) Forward bias diode
- c) Breakdown diode
- d) Both Voltage regulators and Breakdown diode

(xix) What is the left hand section of a junction transistor called?

- a) Base
- b) Collector
- c) Depletion region
- d) Emitter

(xx) Which of the following are true for a PNP transistor?

- a) The emitter current is less than the collector current
- b) The collector current is less than the emitter current
- c) The electrons are majority charge carriers
- d) The holes are the minority charge carriers

(xxi) The transfer of a signal in a transistor is

- a) Low to high resistance
- b) High to low resistance
- c) Collector to base junction
- d) Emitter to base junction

(xxii) In a PNP transistor operating in active region, the main stream of current is

- a) Drift of holes
- b) Drift of electrons
- c) Diffusion of holes
- d) Diffusion of electrons

(xxiii) The AC current gain in a common base configuration is

- a)
- b)

$$-\Delta I_C / \Delta I_E$$

$$\Delta I_C / \Delta I_E$$

- c)

- d)

$$\Delta I_E / \Delta I_C$$

$$-\Delta I_E / \Delta I_C$$

(xxiv) In ICEO, what does the subscript 'CEO' mean?

- a) Collector to base emitter open
- b) Emitter to base collector open
- c) Collector to emitter base open
- d) Emitter to collector base open

(xxv) At 0 K temperature, an intrinsic semiconductor behaves as

- a) Insulator
- b) Conductor
- c) Semiconductor
- d) All of these

(xxvi) When pentavalent impurities like phosphor are added to an intrinsic semiconductor, it becomes a/an

- a) P-type semiconductor
- b) N-type semiconductor
- c) PN-junction
- d) All of these

(xxvii) In an intrinsic semiconductor, the Fermi level  $E_F$  lies

- a) In the middle of the energy band gap
- b) Above the Centre of the energy band gap
- c) Below the centre of the energy band gap
- d) None of these

(xxviii) In an P-type semiconductor, the position of the Fermi level lies

- a) In the middle of the energy band gap
- b) Above the center of the energy band gap
- c) Below the Centre of the energy band gap
- d) Anywhere in the energy band gap

(xxix) The unit of mobility of electrons is

- a)  $\text{cm}^2/\text{V-s}$
- b)  $\text{cm}/\text{V-s}$
- c)  $\text{m}^2/\text{s}$
- d)  $\text{cm}^2/\text{V}$

(xxx) The width of the depletion layer of a PN-junction is

- a) Independent of applied voltage
- b) Increased with applied reverse-bias

voltage

c) Increased with applied forward-bias voltage

d) Increased with doping

(xxxii) The knee voltage of a Ge diode is

a) 0.3V

b) 0.5V

c) 0.7V

d) 0.8V

(xxxiii) The reverse saturation current of a PN-junction diode is

a) Increased with temperature

b) Decreased with temperature

c) Inversely proportional with temperature

d) Independent of temperature

(xxxiv) Light-emitting diode is made by

a) GaAs

b) Si

c) Ge

d) Combination of Si and Ge

(xxxv) When a Zener diode is reverse biased

a) It acts as a constant resistance

b) It acts as a constant voltage source

c) It acts as a constant current source

d) It acts as a variable voltage source

(xxxvi) A voltage regulator is a circuit which can be used

a) To convert the ac voltage to dc voltage

b) To provide a constant dc output voltage in spite of the fluctuations in ac input voltage or load current

c) To regulate the ac input voltage

d) All of these

(xxxvii) Early effect in a transistor is known as

a) Zener breakdown

b) Avalanche breakdown

c) Thermal breakdown

d) Reduction in width of base or base narrowing

(xxxvii)

The value of  $\alpha$  in a bipolar junction transistor is

- a) 0.95 to 0.998
- b) 0.45 to 0.498
- c) 1.95 to 1.998
- d) -0.95 to -0.998

(xxxviii) When used in circuit, the Zener diode is always

- a) Forward-biased
- b) Connected in series
- c) Troubled by overheating
- d) Reverse-biased

(xxxix) When the transistor operates in saturation mode, it behaves as

- a) A closed switch
- b) An open switch
- c) An amplifier
- d) All of these

(xl) When a JFET operates above pinch-off voltage,

- a) Drain current remains constant
- b) Drain current increases rapidly
- c) Drain current decreases gradually
- d) Depletion region becomes zero

(xli) The pinch-off voltage is equal to

- a) Drain-to-source voltage
- b) Gate-to-source voltage
- c) Gate-to-source cut-off voltage
- d) Gate voltage

(xlii) The unit of electrical conductivity is

- a)  $(\Omega\text{-m})^{-1}$
- b)  $\Omega\text{-m}$
- c)  $\Omega$
- d)  $\Omega/\text{m}$

- (xliii) Which of the following doping generates a P-type semiconductor?
- a) Germanium and boron
  - b) Germanium and phosphorus
  - c) Germanium and antimony
  - d) Silicon and phosphorus

- (xliv) A PN –junction is formed when a P-type semiconductor and an N-type semiconductor are
- a) Joined together
  - b) Formed due to diffusion of electrons and holes
  - c) Formed from homogeneous material which is developed by chemical reaction
  - d) All of these

- (xlv) A diffusion current flows through a PN-junction just after its formation due to
- a) Minority carriers
  - b) Majority carriers
  - c) Forward bias
  - d) Reverse bias

- (xlvi) In a Zener diode shunt voltage regulator, the diode regulates the output voltage when the Zener diode
- a) Is forward biased
  - b) Is reverse biased
  - c) Operates at no load
  - d) Operates at any load

- (xlvii) A LED is made up of a .....junction
- a) PNP
  - b) NPN
  - c) PIN
  - d) PN

- (xlviii) The transistor operates in cut-off region if
- a) Collector junction is reverse biased and the emitter junction is forward biased
  - b) Collector junction is forward biased and the emitter junction is reverse biased
  - c) Both the collector junction and the emitter junction are forward biased
  - d) Both the collector junction and the emitter junction are reverse biased

- (xlix) The collector and emitter current levels for a transistor with common



base dc current gain of 0.99 and base current of  $20\mu\text{A}$  are respectively

- a)  $2\text{mA}$  and  $1.98\text{mA}$
- b)  $1.98\mu\text{A}$  and  $2\text{mA}$
- c)  $1.98\text{mA}$  and  $2\text{mA}$
- d)  $2\text{mA}$  and  $1.98\mu\text{A}$

(l) A FET consists of a

- a) Source
- b) Drain
- c) Gate
- d) All of these

(li) After  $V_{\text{DS}}$  reaches pinch-off value  $V_{\text{P}}$  in a JFET, drain current  $I_{\text{D}}$  becomes

- a) Zero
- b) Low
- c) Saturated
- d) Reversed

(lii) In a JFET, drain current is maximum when  $V_{\text{GS}}$  is

- a) Zero
- b) Negative
- c) Positive
- d) Equal to  $V_{\text{P}}$

(liii) For the operation of enhancement- only N-channel MOSFET, value of gate voltage has to be

- a) High positive
- b) High negative
- c) Low positive
- d) Zero

(liv) The outermost electrons of an atom are called ..... electrons

- a) Free
- b) Valence
- c) Conduction
- d) Bound

(lv) The depletion region around a P-N junction

- a) Is quite wide
- b) Contains mobile ions
- c) Has no free charge carrier
- d) Is of constant width

(lvi) An electron device means the device in which the conduction of electrons takes place through

- a) A gas
- b) Vacuum
- c) A semiconductor
- d) A gas, semiconductor or vacuum

(lvii) Which one of the following statements with reference to effective mass is incorrect?

- a) It is a function of wave vector  $K$
- b) It can be positive or negative
- c) It is different from free mass because of lattice interaction
- d) Its concept is applicable only to electrons and not to holes

(lviii) Avalanche multiplication

- a) Disruption of covalent bonds occurs by collision
- b) Direct rupture bonds
- c) Both Disruption of covalent bonds occurs by collision and Direct rupture bonds
- d) None of these

(lix) Consider the following statements for a p-n junction diode: i) It is an active component. ii) Depletion layer width decreases with forward biasing. iii) In the reverse biasing case, saturation current increases with increasing temperature. Which of the statements given above are corrects?

- a) i), ii) and iii)
- b) i) and ii) only
- c) ii) and iii) only
- d) i) and iii) only

(lx) The change in barrier potential of a silicon p-n junction with temperature is

- a)  $0.025 \text{ V}/^\circ\text{C}$
- b)  $0.250 \text{ V}/^\circ\text{C}$
- c)  $0.030 \text{ V}/^\circ\text{C}$
- d)  $0.014 \text{ V}/^\circ\text{C}$

(lxi) At the cut-in voltage of a diode

- a) the potential barrier is overcome and the current through the junction starts to increase rapidly.
- b) the potential barrier is strong and the current through the junction is blocked.
- c) the diode almost behaves like a short.
- d) Both the potential barrier is overcome

and the current through the junction starts to increase rapidly and the diode almost behaves like a short.

(Ixii) Which of the following is not associated with a p-n junction?

- a) junction capacitance
- b) charge storage capacitance
- c) depletion capacitance
- d) channel length modulation

(Ixiii) A Zener diode, when used in voltage stabilization circuits, is biased in

- a) reverse bias region below the breakdown voltage.
- b) reverse breakdown region
- c) forward bias region
- d) forward bias constant current mode

(Ixiv) Which of the following statements is correct?

- a) base region is of low resistivity material and heavily doped.
- b) collector region is of higher conductivity than emitter
- c) emitter region is of high resistivity material and lightly doped
- d) emitter region is of high resistivity and heavily doped.

(Ixv) In a properly biased n-p-n transistor, most of the electrons from the emitter

- a) pass to the collector through the base.
- b) recombine with holes in the base.
- c) recombine with the hole in emitter itself.
- d) are stopped by the function barrier.

(Ixvi) In a junction transistor, recombination of electrons and holes occurs in

- a) base region only
- b) emitter region only.
- c) collector region only
- d) all three regions

(Ixvii) For correct working of an n-p-n bipolar junction transistor, the different electrodes should have the following polarities with respect to an emitter

- a) collector +ve, base -ve
- b) collector -ve, base +ve
- c) collector -ve, base -ve
- d) collector +ve, base +ve

(lxviii) If  $I_E$  is zero (base is open but collector junction is having usual bias), then  $I_C$  is equal to

- a)  $I_B - I_{CO}$
- b) Zero
- c)  $I_B$
- d)  $I_{CO}$

(lxix) Two p-n junction diodes are connected back to back to make a transistor. Which one of the following is correct?

- a) the current gain of such a transistor will be high.
- b) the current gain of such a transistor will be moderate.
- c) it can not be used as a transistor due to large base width.
- d) it can be used only for p-n-p transistor.

(lxx) A transistor works in three regions: i) Cut-off, ii) active, and iii) saturation. Which is used as switch in digital logic gates, the regions it works in are:

- a) i) and ii) only
- b) ii) and iii) only
- c) i) and iii) only
- d) i), ii) and iii)