



## 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 : 75 Minutes

Full Marks : 60

[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 60=60

1. (Answer any Sixty )

(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)

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    |

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

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

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

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

(v) 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

(vi) 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

(vii) 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

(viii) 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

(ix) A FET operates on

- a) Majority carriers only
- b) Minority carriers
- c) Positive and negative ions
- d) Positively charged ions

(x) 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

(xi) 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

(xii) How many junctions do a diode consist?

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

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

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

(xiv) 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

(xv) 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

(xvi) Zener diodes are also known as

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

(xvii) 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

(xviii) 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

(xix) 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

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

- a)  $-\Delta I_C / \Delta I_E$
- b)  $\Delta I_C / \Delta I_E$
- c)  $\Delta I_E / \Delta I_C$
- d)  $-\Delta I_E / \Delta I_C$

(xxi)

The relation between  $\alpha$  and  $\beta$  is

- a)  $\beta = 1 / (1 - \alpha)$
- b)  $\alpha = \beta / (1 + \beta)$
- c)  $\beta = \alpha / (1 + \alpha)$
- d)  $\alpha = \beta / (1 - \beta)$

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

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

(xxiii) In a semiconductor, the band gap is

- a) Zero
- b) Small

c) Large

d) infinity

(xxiv) 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

(xxv) 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

(xxvi) The unit of mobility of electrons is

a)

b)  $\text{cm}^2/\text{V}\cdot\text{s}$

$\text{cm}^2/\text{V}\cdot\text{s}$

c)

d)

$\text{m}^2/\text{s}$

$\text{cm}^2/\text{V}$

(xxvii) The knee voltage of a Ge diode is

a) 0.3V

b) 0.5V

c) 0.7V

d) 0.8V

(xxviii) 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

(xxix) Reverse saturation current in a silicon PN-junction diode is doubled for every

a)

b)

$10^0\text{c}$  increase in temperature

$5^0\text{c}$  increase in temperature

c)

2<sup>0</sup>c increase in temperature

d)

1<sup>0</sup>c increase in temperature

(xxx) Light-emitting diode is made by

a) GaAs

c) Ge

b) Si

d) Combination of Si and Ge

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

a) To convert the ac voltage to dc voltage

c) To regulate the ac input voltage

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

d) All of these

(xxxiii) Early effect in a transistor is known as

a) Zener breakdown

c) Thermal breakdown

b) Avalanche breakdown

d) Reduction in width of base or base narrowing

(xxxiv)

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

a) 0.95 to 0.998

c) 1.95 to 1.998

b) 0.45 to 0.498

d) -0.95 to -0.998

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

a) Forward-biased

c) Troubled by overheating

b) Connected in series

d) Reverse-biased

(xxxvi) 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

(xxxvi) When the transistor operates in cut-off region, it behave as

a) A closed switch

b) An open switch

c) An amplifier

d) All of these

(xxxvii) 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

(xxxviii) The donor impurities

a) Generate electrons

b) Generate holes

c) Generate hole and electrons

d) All of these

(xxxix) 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

(xl) 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

(xli) 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

(xlii) 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

(xliii) A FET consists of a

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

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

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

(xlv) 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

(xlvi) 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

(xlvii) 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

(xlviii) 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

(xlix) An incremental model of a solid state device is one which represents the

- a) ac property of the device at the desired operating point.
- b) dc property of the device at all operating points
- c) complete ac and dc behavior of the device at all operating points
- d) ac property of the device at all operating points.

(l) 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)  $0.014 \text{ V}/^\circ\text{C}$

(li) 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.

(lii) 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

(liii) 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

(liv) 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.

(lv) 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.

(lvi) 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

(lvii) 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

(lviii) 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)  $I_{CO}$

(lix) 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.

(lx) A transistor works in three regions: ) 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)