



**BRAINWARE UNIVERSITY**  
**Term End Examination 2020 - 21**  
**Programme – Diploma in Electrical Engineering**  
**Course Name – Basic Electronics**  
**Course Code - DEE303**

**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)

A diode whose terminal characteristics are related as  $I = I_s e^{V/V_T}$  ( $I_s$  is the reverse saturation current, and  $V_T$  is the thermal voltage(=25mV)) is biased at  $i = 2\text{mA}$ .

Its dynamic resistance is

- |           |             |
|-----------|-------------|
| a) 25 ohm | b) 12.5 ohm |
| c) 50 ohm | d) 100 ohm  |

(iii) 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 |

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

- |                      |           |
|----------------------|-----------|
| a) 0.5 cm            | b) 0.5 mm |
| c) 0.5 $\mu\text{m}$ | d) 0.5 nm |

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

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

(vi)

If the cut-in voltage of a Ge p-n diode is  $V_{r1}$  and that of Si p-n diode is  $V_{r2}$  then

- a)  $V_{r1} = V_{r2}$
- b)  $V_{r1}$  greater than  $V_{r2}$
- c)  $V_{r1}$  less than  $V_{r2}$
- d) none of these

(vii) 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 forward biased
- c) Both emitter and collector junctions are reverse biased
- d) None of these

(viii) If FET operates in cut-off, the depletion layers are

- a) Touching each other
- b) Close together
- c) Far apart
- d) None of these

(ix) The unit of electrical conductivity is

- a)  $(\text{ohm} - \text{meter})^{-1}$
- b) ohm - meter
- c) ohm
- d) ohm/meter

(x) The donor impurities

- a) Generate electrons
- b) Generate holes
- c) Generate hole and electrons
- d) All of these

(xi) Which of the following is method to model a diode's forward characteristics?

- a) Iteration method
- b) Graphical method
- c) Constant-voltage drop model
- d) All of the mentioned

(xii) If the positive terminal of the battery is connected to the anode of the diode, then it is known as

- a) Forward biased
- b) Reverse biased
- c) Equilibrium
- d) Schottky barrier

(xiii) 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

(xiv) 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

(xv) Zener diodes are also known as

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

(xvi) Which of the following can be used in series with a Zener diode so that combination has almost zero temperature coefficient?

- a) Diode
- b) Resistor
- c) Transistor
- d) MOSFET

(xvii) Zener diodes can be effectively used in voltage regulator. However, they are these days being replaced by more efficient

- a) Operational Amplifier
- b) MOSFET
- c) Integrated Circuits
- d) None of these

(xviii) Which of the following is true in construction of a transistor?

- a) The collector dissipates less power
- b) The emitter supplies minority carriers
- c) The collector is made physically larger than the emitter region
- d) The collector collects minority charge carriers

(xix) 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

(xx) When does the transistor act like an open switch?

- a) Cut off region
- b) Active region
- c) Saturated region
- d) None of these

(xxi) The emitter current consists of

- a) Carriers passing from collector to emitter
- b) Carriers passing from base to collector
- c) Carriers passing from emitter to base
- d) None of these

(xxii) 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)  $-\Delta I_E / \Delta I_C$

(xxiii) The base current amplification factor  $\beta$  is given by

- a)  $I_C/I_B$
- b)  $I_B/I_C$
- c)  $I_E/I_B$
- d)  $I_B/I_E$

(xxiv) The output resistance of transistor is given by

- a)
- b)

**$\Delta V_{CE}/\Delta I_B$**

**$\Delta V_{BE}/\Delta I_B$**

- c)
- d)

**$\Delta V_{BE}/\Delta I_C$**

**$\Delta V_{CE}/\Delta I_C$**

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

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

(xxvi) Recombination happens when

- a) A valance electron jumps to conduction band from valence band
- b) An electron falls into a hole
- c) A positive ion and a negative ion bind together
- d) All of these

(xxvii) The most commonly used semiconductor material in manufacturing of electronic devices is

- a) Silicon
- b) Boron
- c) Germanium
- d) Gallium arsenide

(xxviii) 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

(xxix) 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

(xxx) The depletion region of a PN-junction is formed

a) Just after the manufacture of the PN-junction

b) When forward-bias voltage is applied

c) When reverse-bias voltage is applied

d) All of these

(xxxii) The knee voltage of an Si diode is

a) 0.3V

b) 0.5V

c) 0.7V

d) 0.8V

(xxxii) 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

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

a)

b)

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

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

c)

d)

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

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

(xxxiv) 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

(xxxv) 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

(xxxvi) The value of  $\beta$  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

(xxxvii) Which of the following transistor configuration is less dependent on temperature?

- a) Common base                      b) Common collector  
c) Common emitter                      d) All of these

(xxxviii) An operational amplifier possesses

- a) Very large input resistance and very large output resistance                      b) Very large input resistance and very small output resistance  
c) Very small input resistance and very small output resistance                      d) Very small input resistance and very large output resistance.

(xxxix) An operational amplifier has an open-loop gain of 200,000. Its output exhibits saturation at 10V. The threshold differential voltage of the amplifier is

- a) 25 microvolt                      b) 50 microvolt  
c) 0.5 mV                      d) 10V

(xl) Stability can be improved in an op-amp by

- a) Pole zero compensation                      b) Dominant pole compensation  
c) Leads compensation                      d) All of these

(xli) In a single stage R-C coupled amplifier, what are the phase shifts introduced at lower and upper 3 dB frequencies respectively?

- |                           |                           |
|---------------------------|---------------------------|
| a)                        | b)                        |
| $45^{\circ}, 225^{\circ}$ | $45^{\circ}, 135^{\circ}$ |
| c)                        | d)                        |
| $90^{\circ}, 180^{\circ}$ | $45^{\circ}, 180^{\circ}$ |

(xlii) The common mode rejection ratio of an OP AMP is

- |                            |                           |
|----------------------------|---------------------------|
| a) Much smaller than unity | b) Much larger than unity |
| c) unity                   | d) none of these          |

(xliii) An ideal OP AMP has

- |                             |                          |
|-----------------------------|--------------------------|
| a) Infinite input impedance | b) Zero output impedance |
| c) Infinite voltage gain    | d) All of these          |

(xliv) The slew rate of an ideal OP AMP is

- |                     |                      |
|---------------------|----------------------|
| a) Zero             | b) Infinity          |
| c) 1 V/micro second | d) 10 V/micro second |

(xlv) If the input is a rectangular pulse, the output of an integrator is

- |              |                     |
|--------------|---------------------|
| a) sine wave | b) square wave      |
| c) ramp      | d) rectangular wave |

(xlvi) The input resistance of 741 OPAMP is

- |                       |                        |
|-----------------------|------------------------|
| a) 100 ohm            | b) approx. 20 Kilo ohm |
| c) approx. 2 Mega ohm | d) 20 Mega ohm         |

(xlvii) Current can not flow to ground through

- |                        |                 |
|------------------------|-----------------|
| a) a mechanical ground | b) an AC ground |
|------------------------|-----------------|



c) a virtual ground

d) an ordinary ground

(xlvi) An oscillator actually does not generate energy but merely convert the energy available from

a) DC biasing source

b) active device

c) mechanical input

d) none of these

(xlvii) 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.

(i) In a semiconductor diode schematic symbol, arrow head represents

a) N-type material

b) P-type material

c) Both p and n-type material

d) None of these

(ii) 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

(iii) In p-n junction, the avalanche breakdown voltage with semiconductor resistivity

a) Decreases

b) Increases

c) Both the parameters are independent

d) Decreases or increases in abrupt p-n junction

(iv) For heavily doped diode

a) Zener breakdown is like to take place

b) Avalanche breakdown is like to take

place

c) Either (Zener breakdown is like to take place) or ( Avalanche breakdown is like to take place) will take place

d) Neither (Zener breakdown is like to take place) nor ( Avalanche breakdown is like to take place) will take place

(liv) The doping concentration on the n-side of a p-n junction diode is enhanced. Which one of the following will get affected?

a) Width of the depletion region on n-side.

b) Width of the depletion region on p-side.

c) Width of the depletion region on both sides.

d) No change in width of depletion regions.

(lv) The reverse current of a silicon diode is:

a) highly bias voltage sensitive

b) highly temperature sensitive

c) both bias voltage and temperature sensitive

d) independent of bias voltage and temperature

(lvi) What is the typical value for the ratio of current in a p-n junction diode in the forward bias and that in the reverse bias?

a) 1

b) 10

c) 100

d) 1000

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

(lviii) 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)

(lix) The junction capacitance of a p-n junction depends on

- a) doping concentrations only
- b) applied voltage only
- c) both doping concentration and applied voltage
- d) barrier potential only

(lx) Zener diode is used as the main component in dc power supply for

- a) rectification
- b) voltage regulation
- c) filter action
- d) both (rectification) and (voltage regulation)

(lxi) 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.

(lxii) The emitter of a transistor is generally doped the heaviest because it

- a) has to dissipate maximum power.
- b) has to supply the charge carriers.
- c) is the first region of the transistor.
- d) must possess low resistance.

(lxiii) 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.

(lxiv) 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.

(lxv) The current  $I_{CBO}$  flows in the

- a) emitter and base leads
- b) collector and base leads
- c) emitter and collector leads
- d) none of these

(lxvi) For a given emitter current, the collector, the collector current can be increased by

- a) reducing the recombination rate in the base region.
- b) doping the emitter region lightly.
- c) reducing the minority carrier mobility in the base region.
- d) making the base region more wider.

(lxvii) 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.

(lxviii) In a junction transistor, the collector cut-off current ' $I_{CBO}$ ' reduces considerably by doping the

- a) emitter with high level of impurity.
- b) emitter with low level of impurity.
- c) collector with high level of impurity.
- d) collector with low level of impurity.

(lxix) In cut-off region in an n-p-n transistor

- a)  $V_{CB}$  is +ve and  $V_{BE}$  is -ve.
- b)  $V_{CB}$  is -ve and  $V_{BE}$  is +ve.
- c) both  $V_{CB}$  and  $V_{BE}$  are +ve.
- d) both  $V_{CB}$  and  $V_{BE}$  are -ve.

(lxx) The cut-in-voltage for gallium arsenide diode is

- a) 1.2 V
- b) 0.7 V
- c) 0.3V
- d) None of these