

B.Sc. ELECTRONICS
First Semester
Basic Electronics
(BSE-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 (any five)

2×5=10

a) From the fig1 find the voltage across the resistor R1.

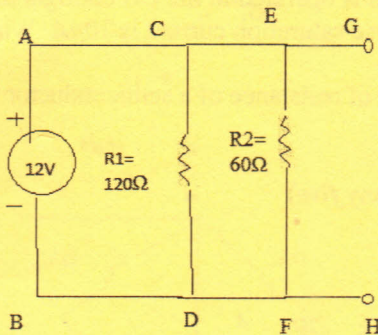


Fig1

b) Define diffusion current in a semiconductor.

c) What is receiver saturation current?

d) What are the two types of capacitances across P-N Junction?

e) What are different types of FET?

f) What do you understand by transistor biasing? Why is it necessary to bias a transistor?

g) Draw the IV characteristics of JFET.

2. Answer the following questions (any five)

3×5=15

a) Describe the difference between open circuit and a short circuit.

b) Prove that if $V_T = V_1 + V_2 + V_3$, then $R_T = R_1 + R_2 + R_3$

c) Differentiate semiconductors, conductors and insulators on the basis of band gap?

d) Explain the static and dynamic resistances in P-N junction diode. Determine dc resistance levels for the diode in following figure at

i) $I_D = 2\text{mA}$

ii) $I_D = 20\text{mA}$

iii) $V_D = -10\text{V}$

e) Compare three Configurations CB, CC and CE in terms of their resistances?

f) An N-P-N transistor with $\alpha = 0.98$ is operated in the CB configuration. If the emitter current is 3mA and reverse saturation current is $10\mu\text{A}$. What are the base current and collector current?

g) Why the temperature coefficient of resistance of a semiconductor is negative?

3. Answer the following questions (any five)

5×5=25

a) Find V_s using Kirchoff's law

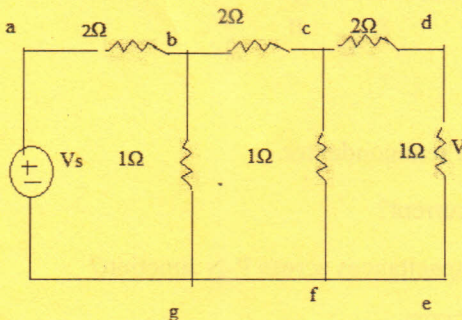


Fig2

- b) Derive an expression for Fermi level in intrinsic semiconductor.
 c) Explain in detail the break down mechanisms in a diode.
 d) Explain the current components in a transistor.
 e) (i) Determine the value of the base current of a common base configuration whose current amplification factor is 0.92 . Emitter current is 1mA.
 (ii) At $V_{ce} = 7.5V$, the change in collector current is 1.2 mA for a change in base current of 20mA. Find β of the transistor.
 f) Explain the working principle of pn diode in forward and recover bias conditions.
 g) Determine equivalent resistance R across X-Y in figs. 3 (a, b and c)

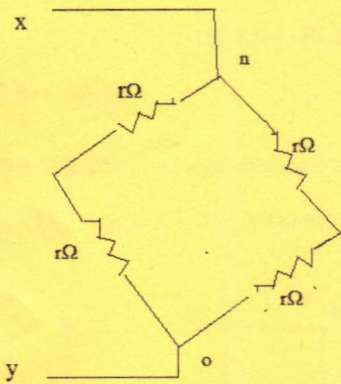


Fig3a

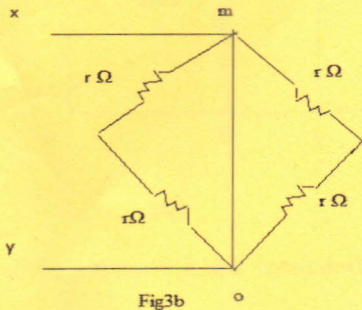


Fig3b

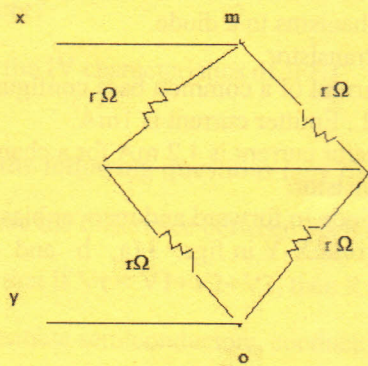


Fig3c

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

Duration: 20 minutes

Marks – 20

PART A- Objective Type

A. Choose the correct answers:

1×20=20

1. The unit of Potential difference is the
a) Volt b) ampere c) Siemens d) Coulomb
2. Conventional current is considered
a) The motion of negative charges in the opposite direction of electron flow.
b) The motion of positive charges in the same direction as electron flow.
c) The motion of positive charges in the opposite direction of electron flow.
d) Uone of the above.
3. A heater draws and 8A current from the 120 – V power line. How much is the resistance.
a)16 Ω b)15 Ω c)12 Ω d)120 Ω
4. If a resistor in a series circuit is shorted, the series current, I
a) Decreases b) stay the same c) increases d) drops to zero
5. An applied V_T of 120V Produces IR drops across two series resistors R1 and R2. If the voltage drop across R1 is 40V, how much is the voltage drop across R2?
a) $V_2 = 100V$ b) $V_2 = 81V$ c) $V_2 = 80V$ d) $V_2 = 70V$
6. The forbidden gap for semiconductor is
a) 5eV b) 1eV c) 1V d) Zero
7. The junction barrier potential for Silicon (Si)
a) 0.7V b) 0.3V c) 0.72V d) 0.33V
8. Under thermal equilibrium the product of concentration of free electrons and concentration of holes intrinsic semiconductor.
a) $np = n_i$ b) $np = n_i^3$ c) $np = n_i^2$ d) $np = n_i^4$
9. The drift velocity V is
a) $V = \mu_e E$ b) $V = \mu_e E i$ c) $V = \mu_e E e$ d) $V = \mu_e E f$
10. A ideal diode permits
a) Bidirectional conduction b) dual directional conduction
c) Multi directional conduction d) unidirectional conduction

11. For a P – N diode, for a reverse bias voltage exceeding $V_T = 26 \text{ mV}$ at room temperature (27°C or 300K)
- a) $I = I_h + I_e$ b) $I = -I_0$ c) $I = I_0$ d) $I = -I_i$
12. In P – N diode, in the breakdown region the reverse current
- a) Decreases rapidly b) constant c) zero d) increases rapidly
13. The ratio of apparent backward to forward resistance for silicon diodes is
- a) $100 : 1$ b) $1 : 1000$ c) $1,000,000 : 1$ d) $1 : 1,000,000$
14. When a P – N junction is reverse biased, the transition capacitance.
- a) $C_T = \frac{dQ}{dV}$ b) $C_T = \frac{dV}{dQ}$ c) $C_T = \frac{dq}{dt}$ d) $C_T = \frac{dV}{dt}$
15. In a forward biased diode the diffusion capacitance C_D and transition capacitance C_T are.
- a) $C_D \ll C_T$ b) $C_D = C_T$ c) $C_D \gg C_T$ d) none
16. The best instrument for testing P – N junction is
- a) Multi meter b) Ammeter c) Ohmmeter d) Voltmeter
17. The efficient one is
- a) MOSFET b) NMOFET c) FET d) IGFET
18. The quantity beta β provides an important relationship between the base and collector currents and is usually between.
- a) 50 and 400 b) 50 and 500 c) 50 and 800 d) 50 and 1000
19. The quantity α relates the collector and emitter currents $\{ \alpha = \frac{I_C}{I_E} \}$ and is always approximately equal to
- a) $\alpha \gg 1$ b) $\alpha = 50$ c) $\alpha = 1$ d) $\alpha \ll 0$
20. The region of operation of a transistor when Emitter – Base (EB) Junction is forward-Biased and Collector – Base (CB) Junction is reverse biased.
- a) active b) Saturation c) cutoff d) inverted
