B.Tech/AEIE/CSE/ECE/IT/2nd Sem/ECEN-1001/2016

2016

BASIC ELECTRONICS ENGINEERING

(ECEN 1001)

Time Alloted : 3 Hours   *Full Marks : 70*

Figures out of the right margin indicate full marks.

*Candidates are required to answer Group A and <u>any 5 (five)</u>
from Group B to E, taking <u>at least one</u> from each group.*

*Candidates are required to give answer in their own words
as far as practicable*

<u>GROUP - A</u>
(Multiple Choice Type Questions)

1. Choose the correct alternatives for the following : **[10×1=10]**

   i) If the temperature of an n-type semiconductor is very high then it becomes

   (a) more n-type   (b) p-type

   (c) intrinsic   (d) none of these

   ii) In Enhancement n-channel MOSFET, an induced n type channel can be produced between the source and the drain if

   (a) $V_{GS} = 0$ (b) V_{GS} is positive

   (c) V_{GS} is negative   (d) none of these

   iii) In a center tap full wave rectifier, if V_m is the peak voltage between center tap and one end of the secondary, the maximum voltage coming across the reverse bias diode is

   (a) V_m (b) $2V_m$ (c) $V_m/2$ (d) $V_m/\sqrt{2}$

   iv) The op amp can amplify

   (a) AC signals only

   (b) DC signals only

   (c) both AC and DC signals

   (d) neither AC not DC signals

   v) Avalanche breakdown is primarily dependent on the phenomenon of

   (a) collision.   (b) doping.

   (c) ionization.   (d) recombination.

   vi) The depletion region in an open circuited P-N junction contains

   (a) electrons.

   (b) holes.

   (c) uncovered immobile impurity ions.

   (d) neutralized impurity atoms.

   vii) In active region operation of a transistor

   (a) both junctions are reversed biased.

   (b) both junctions are forward biased.

   (c) emitter junction is forward biased while collector junction is reverse biased.

   (d) emitter junction is reversed biased while collector junction is forward biased.

viii) The best method of bias is

(a) base resistor method

(b) collector to base bias

(c) base bias with collector and emitter feedbacks

(d) voltage divider bias

ix) When a reverse bias is applied to the gate of JFET, the depletion region width

(a) is uniform in the channel

(b) is wider near the source and tapers near drain

(c) is wider near drain and tapers near source

(d) is nil

x) Positive feedback is used in

(a) amplifiers   (b) rectifiers

(c) oscillators   (d) detectors

GROUP - B

2. (a) Explain drift and diffusion of charge carrier in semiconductors.

(b) Distinguish between Zener breakdown and Avalanche breakdown.

(c) Explain how the Zener diode can be used for voltage regulation, with the help of proper circuit diagram.

$$4+5+3 = 12$$

3. (a) Explain the operation of a bridge rectifier with the help of a circuit diagram. Find the PIV.

(b) Evaluate the ripple factor and efficiency of a half wave rectifier.

$$6+6 = 12$$

GROUP - C

4. (a) What is transistor? Why is it so called? How it is biased?

(b) Explain the mechanism of current flow in a PNP transistors.

(c) A germanium transistor with $a=0.98$ gives a reverse saturation current $I_{CBO} = 10uA$ in common base configuration. When transistor is used in CE configuration with a base current of 0.22 uA, calculate the collector current.

$$(1+1+1)+(5)+4 = 12$$

5. (a) Define Stability Factor of Bipolar Junction Transistor and state its significance.

(b) In a collector to base bias circuit indicated in Fig.1, a transistor with $\beta = 100$ is used. Supply voltage $V_{CC} = 20V$, $V_{BE} = 0.7V$, collector resistor $R_C = 1k\ \Omega$. The bias is obtained by connecting 100K Ω resistor from collector to base. Find the Q-point and stability factor.
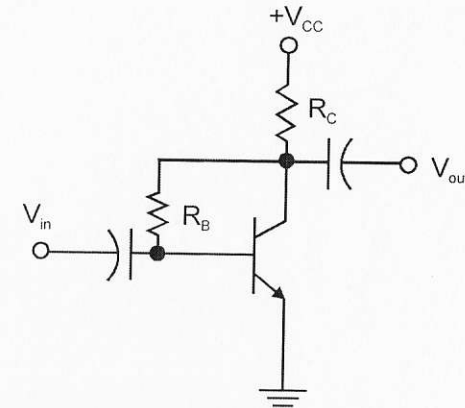

Fig.1.

$$4+8 = 12$$

Group - D

6. (a) Describe the working principle of JFET with neat diagram.

   (b) Explain how JFET can be used as a Voltage Variable Resistor (VVR).

   $$6+6 = 12$$

7. (a) Explain the basic construction of an enhancement type P-channel MOSFET. Draw and explain its static characteristics.

   (b) In what respect, a JEFT differs from MOSFET?

   (c) Define : The pinch-off voltage. $(4+3)+3+2 = 12$

GROUP - E

8. (a) What do you mean by feedback in amplifier? Define negative and positive feedbacks.

   (b) Explain a feedback amplifier with the help of a block diagram.

   (c) A negative feedback of $\beta = 0.002$ is applied to an amplifier of gain 1000.Calculate the change in overall gain of the feedback amplifier if the internal amplifier is subjected to a gain reduction of 15%.

   $$(2+1+1)+4+4 = 12$$

9. (a) Draw and explain the circuit of (i) Voltage follower, (ii) Subtractor using op-amp.

   (b) Describe the use of an op-amp as an integrator. Draw appropriate input and output waveforms.

   (c) A 5 mV, 1 kHz sinusoidal signal is applied to the input of an op-amp integrator for which R = 100k Ω and C = 1µF.Calculate the output voltage.

   $$4+4+4 = 12$$