(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 3033   Roll No. [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

B. Tech.

(SEM. I) ODD SEMESTER THEORY EXAMINATION 2010-11

ELECTRONICS ENGINEERING

Time : 3 Hours   *Total Marks : 100*

Note : Attempt **all** the questions. All questions carry equal marks.

1. Attempt any **four** parts of the following :   **(5×4=20)**

    (a) Explain the effect of acceptor and donor impurities in an intrinsic semiconductor.

    (b) Draw and explain the equivalent circuit of a p-n junction diode.

    (c) Classify conductors, semiconductors and insulators on the basis of energy band diagram.

    (d) For a semiconductor diode, define static and dynamic resistances.

    (e) Explain the working of a p-n junction diode under forward biased and reverse biased condition.

    (f) Explain diffusion and transition capacitance.

2. Attempt any **four** parts of the following :   **(5×4=20)**

    (a) Sketch the circuit for a half-wave rectifier. Explain its operation and derive the expression for the dc current.

    (b) What is voltage multiplier ? Explain with voltage doubler circuit.

(c) Describe the physical mechanism of zener breakdown. For the circuit of Figure 1, find the voltage drop across the 5 kΩ resistance.
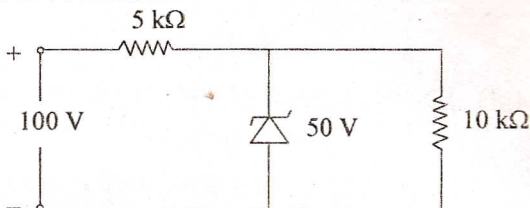

Figure 1

(d) What is filter ? Explain working principle of a capacitive filter with suitable diagram.

(e) Draw circuit diagrams to show two methods of producing a positive output voltage from a halfwave rectifier. Explain briefly the circuit operations.

(f) What is clipper circuit ? How does such a circuit differ from a clamper circuit ? Draw typical circuits for both.

3. Attempt any **two** parts of the following : (10×2=20)

(a) Sketch a voltage divider bias circuit using an npn transistor. Show all voltage polarities and current directions. Explain the operation of the circuit and write the approximate equations for V_B, I_E, I_C and V_{CE}.

(b) Derive the expressions for voltage gain, current gain and input impedance in terms of h-parameters for common emitter amplifier.

(c) A junction transistor has the following h-parameters $h_{ie} = 2k$, $h_{re} = 1·6 \times 10^{-4}$, $h_{fe} = 50$, $h_{oe} = 50$ μA/V. Determine the current gain, voltage gain, input resistance and output resistance of CE amplifier if the load resistance is 12 kΩ and source resistance is 500 Ω.

4. Attempt any **two** parts of the following : $(10\times2=20)$

(a) What is the signficant difference between the construction of an enhancement type MOSFET and depletion type MOSFET ? Explain with suitable diagram.

(b) What are the advantage of the FET over a conventional bipolar junction transistor ? Define Pinch-off voltage, amplification factor and drain resistance of FET. Explain with the help of circuit diagram, how an FET is used as a voltage dependent resistor.

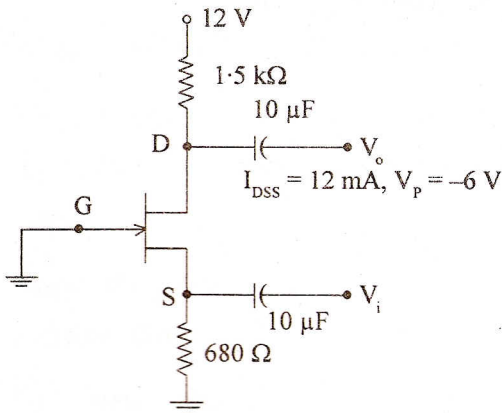(c) Determine the following for the network of figure 2. $-V_{GSQ}, I_{DQ}, V_D, V_G, V_S$ and V_{DS}.

Figure 2

5. Attempt any **four** parts of the following : $(5\times4=20)$

(a) Prove that NAND and NOR gates are universal gate.

(b) Explain the terms in Op-Amp :

   (I) Input offset current

   (II) Slew rate

   (III) CMRR.

(c) Draw the circuit diagram of Op-Amp as summer. Also find out the expression for output.

(d) Minimize using K-Map :

f(A, B, C, D) = $\Sigma m(0, 2, 3, 5, 7, 12, 15) + \Sigma d(1, 4, 8, 11)$.

(e) Compare characteristics of an ideal Op-Amp and practical Op-Amp.

(f) Obtain the following conversions :

(i) $(397 \cdot 75)_{10} = (\quad)_{16}$

(ii) $(101010 \cdot 10)_4 = (\quad)_8$

(iii) $(23 \cdot AB)_{16} = (\quad)_2$

(iv) $(101 \cdot 01)_2 = (\quad)_{10}$

(v) $(7841)_9 = (\quad)_{10}$.