Second Semester Examination – 2007

BASIC ELECTRONICS

Full Marks – 70

Time – 3 Hours

*Answer Question No. **1** which is compulsory and any **five** from the rest.*

The figures in the right-hand margin indicate marks.

1. Answer the following questions : 2×10

   (a) What is the significance of virtual ground of an OP-AMP ?

   (b) Distinguish Avalanche and Zener break-down.

   (c) (i) Convert $(30.3)_{10}$ to equivalent binary number.

   (ii) What is the decimal equivalent of hexadecimal number $(BAD)_{16}$?

(d) What is the speciality of XOR gate ?

(e) Simplify $(A + \bar{B} + C)(\bar{A}\bar{B}\bar{C}\bar{D})$.

(f) In a CE transistor, the base current in a transistor is 0.01 mA and emitter current is 1 mA. Calculate the values of α and β.

(g) The output voltages of an amplifier with 10 volt at 5 kHz and 7.07 V at 25 kHz, what is the decibel change in the output power level ?

(h) A three-stage amplifier has first stage voltage gain of 100, 2nd stage voltage gain of 200, 3rd stage voltage gain of 400. Find the total voltage gain in db.

(i) How a BJT can be used as a switch ?

(j) Give a basic block diagram description of A/D conversion in digital communication system.

2. Draw the circuit diagrams of the half-wave and full-wave rectifier circuits and explain how they work ? 10

3. Consider an amplifier operating from +/– 10V power supplies. It is fed with sinusoidal voltage having 1V peak and delivers a sinusoidal voltage output of 9 V peak to a 1 KΩ load. The amplifier draws a current of 9.5 mA from each

of its two power supplies. The input current of the amplifier is found to be sinusoidal with 0.1 mA peak. Find the voltage gain, the current gain, the power gain, the power drawn from the d.c. supplies, the power dissipated in the amplifier and the amplifier efficiency. 10

4. What is a flip-flop ? Show the logic implementation of R-S flips flop. Draw its truth table and mark the invalid entry. 2+6+2

5. (a) What are voltage current power amplifiers ? Name the different classes of operation of an amplifier. 4

(b) A class A power amplifier has zero signal collector current of 50 mA. If the collector supply voltage is 5 V, find (i) the maximum a.c. power output (ii) power rating of the transistor (iii) maximum collector efficiency. 6

6. Describe the basic FET amplifier configurations : 10

(a) common-source

(b) common-drain

(c) common-gate.

7. (a) Draw the functional block diagram of a CRO. 2.5

(b) What is the function of horizontal sweep generator? 2.5

(c) Explain why envelope detector is only useful for AM demodulation not for FM demodulation. 2.5

(d) What do you mean by trigger generator in CRO? 2.5

8. (a) How a Zener-diode is used in a voltage regulator? 3

(b) A germanium diode carries a current of 10 mA when forward bias of 0.2 volt applied. 7

(i) Estimate the reverse saturation current (I_s)

(ii) Calculate the voltage needed for the diode currents of 1 mA and 100 mA. Comment on the range of these voltages.

The above data applies at room temperature. Extimate I_s at 20° above this temperature and also the value of diode current at 0.2 forward bias.
