2016

MCA 1st Semester Examination

BASIC ELECTRONICS OF DIGITAL LOGIC

PAPER—MCA-103

Full Marks : 100

Time : 3 Hours

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Answer any *seven* questions.

1. (a) Explain clearly the meaning of hole as referred to a semiconductor. 2

(b) What is meant by an intrinsic and extrinsic semiconductor ? 2+2

(c) For an intrinsic semiconductor show that $\sigma_i = en_i(\mu_p + \mu_n)$; where the symbols have their usual meanings. 4

2. (a) For an unbiased p-n junction, sketch the variation of the space charge, electric field, electrostatic potential and electron energy as a function of distance across the junction. 1×4

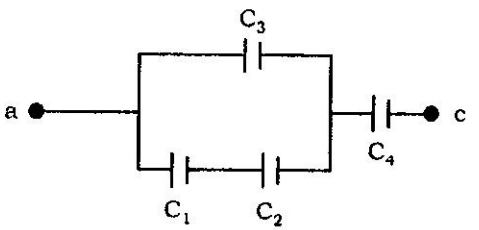
(b) Explain how the dc output voltage of a full-wave rectifier is improved when a capacitor filter is used. Draw waveforms of the load voltage and the diode current. 4+1×2

3. (a) Explain the term transistor biasing. What are the factors determining the choice of the Q-point ? 2+2

(b) Draw the circuit diagram showing the self-bias of an n-p-n transistor in the CE mode. Explain physically how self biasing resistor improves the stability. What is the function of the bypass capacitor ? 3+2+1

4. (a) Derive the expression for the op-amp used as a peak detector and draw the circuit diagram. 5

(b) In the circuit given below $C_1 = 60\ \mu F$, $C_2 = 20\ \mu F$, $C_3 = 9\ \mu F$ and $C_4 = 12\ \mu F$. If the potential difference b/w points a and b is $V_{ab} = 120V$, find the charge of the 2nd capacitor.



5

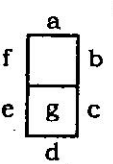
5. (a) Represent the decimal number 8620 (a) in BCD (b) in excess-3 code. 3

(b) Using 2's complement subtract : 100 – 110000. 2

(c) What is Parity BIT ? What is its use ? 2

(d) What do you mean by a 32 × 8 ROM. 3

6. (a) Design the BCD to seven segment decoder circuit and construct the required truth table of the following :



5

(b) Simplify the following Boolean function by using Quine-Mc Clusky method of reduction.
$F(w, x, y, z) = \Sigma(1, 4, 6, 7, 8, 9, 10, 11, 15)$ check the simplification with prime-implicant chart. 5

7. (a) Convert the following in Gray code
1011, 1101. 3

(b) Convert the following Gray code to BCD 1100, 0101. 3

(c) Represent the following no. in a's complement form
1235, 4658. 2

(d) Represent the following no. into 2's complement form
1011, 1010. 2

8. (a) Implement the following function by using 4 : 1 MUX
$F(A, B, C) = \Sigma(0, 1, 3, 4, 6, 7)$ 4

(b) Design a two bit comparator circuit. 6

9. (a) Design a MOD-8 ripple counter.

(b) Design a random counter to count following states (1, 3, 4, 5, 7, 6, 0, 2)

[Internal Assessment : 30]

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