MCA/IS/103/13

MCA 1st Semester Examination, 2013

BASIC ELECTRONICS AND DIGITAL LOGIC

PAPER –CS/MCA-103

Full Marks : 100

Time : 3 hours

Answer any **seven** questions

The figures in the right-hand margin indicate marks

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

Illustrate the answers wherever necessary

1. (*a*) Define the term 'doping'. 2

(*b*) Explain the variation of Fermi level with temperature in extrinsic semiconductor. 3

(*c*) Explain – "Semiconductors behave as insulator at OK". 2

(*d*) What are the differences between a Zener diode and an ordinary *p-n* junction diode. 3

2. (*a*) Explain briefly the operation of a Bridge rectifier with diagram. What are the advantages of a bridge rectifier as compared to a full wave center tapped rectifier ? 5

(*b*) Define ripple factor. Calculate its value for half wave and full wave rectifier. 3

(*c*) Describe the terms capacitor input filter and inductor input filter. 2

3. (*a*) Define α and β of transistor. Find the relation between them. 4

(*b*) Explain the input and output characteristics of a transistor in CB configuration. 6

4. (*a*) Draw the block diagram of a typical op-amp. 3

(*b*) Write the characteristics of ideal op-amp. 2

(*c*) Derive the expression for the op-amp used as a non-inverting amplifier and draw the circuit diagram. 5

5. (*a*) Is it possible to produce a junction transistor by connecting two-diode together ? Explain with proper reasoning. 2

(*b*) Why biasing is needed ? 2

(*c*) A transistor in CE mode configuration the voltage drop across 5 kΩ resistance which is connected in the collector circuit is 5 volt. Find the base current. The current gain $\alpha = 0{\cdot}998$. 4

(*d*) What are the advantages of negative feedback over positive feedback ? 2

6. (*a*) Convert the following decimal number to BCD (*i*) 2019_{10} (*ii*) 9701_{10}. 2

(*b*) What is a Gray Code ? Why it is important ? 2

(*c*) Express the function $Y = A + \overline{B}C$ in canonical POS form. 3

(*d*) Using the K-Map method, obtain the minimum sum of product expression of the following function :

$$Y = \Sigma\,(0, 2, 3, 6, 7, 8, 10, 11, 12, 15)$$ 3

7. (*a*) What is BCD adder. Explain with circuit diagram. 6

(*b*) Explain with the help of K-map how we convert BCD to excess 3 code. 4

8. (*a*) Convert JK flip-flop to D flip-flop. 4

(*b*) What is magnitude comparator ? Draw and explain 2-bit magnitude conparator. 5

(*c*) Write the applications of comparator. 1

9. (*a*) Show how the JK flip-flop can be operated as a toggle flip-flop. 3

(*b*) Implement the following function using 8 : 1 MUX $F(A, B, C, D) = [m(0, 7, 8, 9, 10, 11, 15)$. 4

(*c*) Define race around condition. 3

10. (*a*) What is decoder ? Implement a full subtractor using 3 : 8 decoder. 4

(*b*) Design 3 bit UP-down synchronous counter. 6