CHITKARA UNIVERSITY

2023-2024

**Sessional Test I–SET B, January 2023**

Roll No: .....

[Total No. of Pages: 2]

Time: 90 minutes

Max. Marks: 40

Programme: B.E CSE
Course Title: Basic Electronics
Course Code: 22EC001

General Instructions:

- Follow the instructions given in each section.
- Do not write anything on the question paper, except your roll no.
- Make sure that you attempt the questions in order.

## Section-A

*(All Questions are Compulsory, Each question carries 01 mark)*

1. A Resistor with color bands Red, Orange, and Violet will have a value of__.
   (a) 237 Ω (b) 230Ω
   (c) 245Ω (d) 269Ω
2. The atomic numbers of Si, Ge, and GaAs are___ respectively.
   (a) 14,31,32 (b) 14,32,31
   (c) 14,30,32 (d) 14,30,31
3. The minimum reverse voltage that makes the diode conduct appreciably in reverse bias is called as_.
   (a) Knee voltage (b) Peak Inverse Voltage
   (c) Breakdown voltage (d) Zener Voltage
4. Which type of doping occurs in Avalanche and Zener diodes?
   (a) Light and heavy doping respectively (b) Only light doping
   (c) Heavy and light doping respectively (d) Only heavy doping
5. From which material are the Red, Orange, and Yellow LEDs made of?
   (a) Aluminium Phosphide Gallium (b) Aluminium Indium Gallium Phosphide
   (c) Boron Aluminium Indium Phosphide (d) Gallium Arsenide Phosphide

## Section-B

*(Attempt any 05 questions, each question carries 3 marks, subparts (if any) carry equal weightage)*

6. Illustrate and explain in brief the utilization of a Zener diode as a voltage regulator with the help of a neat diagram.
7. Mention any two applications each of a photodiode and LED. Also draw their symbols.
8. Name the different regions of operations of a BJT. Also list its two applications.
9. Draw the circuit symbols of N channel DE MOSFET, P channel EN MOSFET and N channel JFET.
10. Complete the information in the Table below:

| | BJT | MOSFET |
|---|---|---|
| Terminals | | |
| Type of Device (current/voltage controlled) | | |
| Current flow (unipolar/bipolar) | | |

11. Draw a PN-junction in forward and reverse biased conditions. What is the significance of drift and diffusion currents in an intrinsic semiconductor?

## Section-C

*(Attempt any 2 questions, each question carries 5 marks, subparts (if any) carry equal weightage)*

12. Identify the type of transistor shown in Figure1 below. If the transistor has $I_B$ = 100 mA and $I_C$ = 2 mA. Find (a) β of the transistor; (b) emitter current IE, (c) if $I_B$ changes by + 25 mA and $I_C$ changes by + 0.6 mA, find the new value of β.

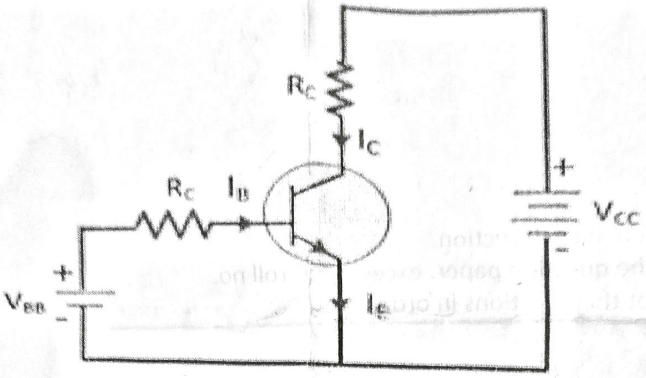


Figure1

13. Explain the operating areas of the NPN Transistor in CE configuration with the help of input and output characteristics.

14. In the center-tap full wave rectifier shown in Figure2 below, the load resistance R is 1 Kilo-ohm. Each diode has forward bias dynamic resistance of $r_d$ = 10 ohms. The secondary winding voltage is 220 sin 3124t volts. Find (a) the peak value current, (b) the dc value of the current (c) the RMS value of the current, (d) the ripple factor (e) the output dc power.

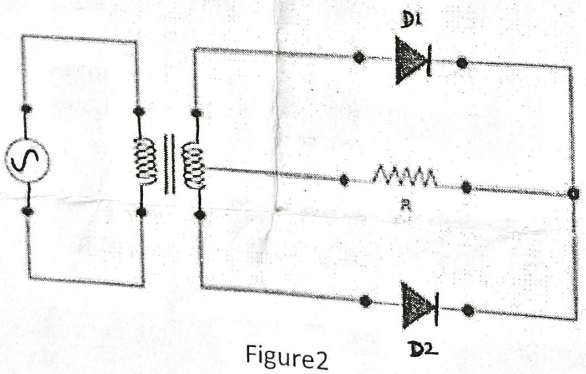


Figure2

## Section-D

*(Attempt any 1 question, each question carries 10 marks, subparts (if any) carry equal weightage)*

15. Explain the working of N-Channel JFET with the help of a circuit diagram and draw the characteristic curves.

(b) Differentiate between Depletion and Enhancement MOSFET?

16. In the Figure3 shown below, the turns ratio of the transformer used in the half wave rectifier is $N_1$: $N_2$ = 12: 1. The primary is connected to power mains of 220V, 50 Hz. Assuming the diode resistance in forward bias to be zero, calculate (a) dc voltage, $V_{dc}$, across the load $R_L$ (b) dc current, $I_{dc}$ and (c) PIV of diode.

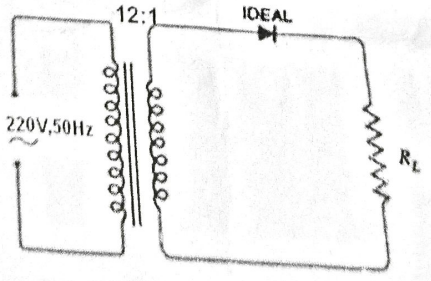


Figure3

CHITKARA UNIVERSITY

**Sessional Test II – SET A, February 2023** 2022-2023

Roll No: 2210991235
Programme: B.E. - CSE
Course Title: Basic Electronics
Course Code: 22EC001

[Total No. of Pages: 2]
Time: 90 minutes

Max. Marks: 40

General Instructions:

- Follow the instructions given in each section.
- Do not write anything on the question paper, except your roll no.
- Make sure that you attempt the questions in order.

## Section-A

*(All Questions are Compulsory, Each question carries 01 mark)*

1. Which of the following represents the one's complement of the binary number 011011?
   (a) 000111 (b) 100100
   (c) 111001 (d) 110001
2. The 4-bit gray code for decimal number 5 is:
   (a) 1110 (b) 1010
   (c) 1000 (d) 0111
3. Which of the following gates can function on a single input?
   (a) NOT (b) AND
   (c) OR (d) Ex-OR
4. A+BC=_____,if A=1
   (a) 0 (b) A
   (c) 1 (d) A+BC
5. How many bits are needed to store one BCD digit?
   (a) 1 bit (b) 2 bits
   (c) 3 bits (d) 4 bits

## Section-B

*(Attempt any 05 questions, each question carries 3 marks, subparts (if any) carry equal weightage)*

6. Match the logic gates in column A with their equivalent in column B as given in Figure 1.

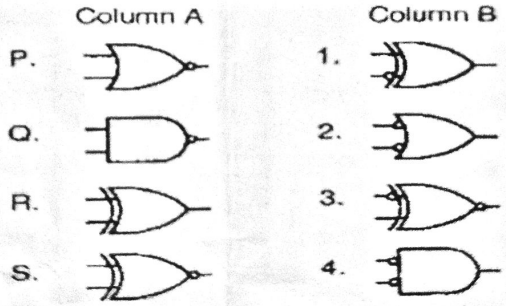


Figure 1

7. Simplify the following Boolean expression: F= [A B' (C + B D) + A' B'] C
8. Mention the difference between signed and unsigned binary numbers. Specify -7 in 8 bit format using sign-magnitude representation.
9. Express the following function (F) in canonical SOP form.
   F = A B' C + B C' + AC
10. Find range of 6 bit unsigned binary numbers. Also, find minimum and maximum value in this range.
11. Consider the logic diagram as shown in the Figure 2. Determine the output expression Q if A, B and C are applied as inputs to the logic circuit.

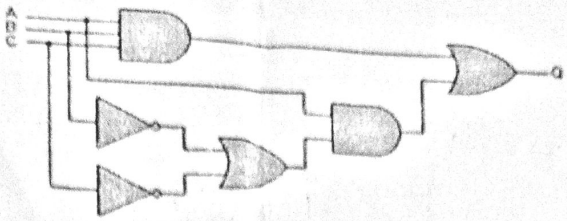


Figure 2

## Section-C

*(Attempt any 2 questions, each question carries 5 marks, subparts (if any) carry marks as specified in front of question statement)*

12. Determine the minimum output expression for the following logic function using Karnaugh map

$$F(A,B,C,D) = \sum m\,(1,3,5,8,9,11,15) + d(2,13)$$

13. NOR and NAND logic gates are categorised as Universal Gates. Justify the De Morgan's Theorems statements by constructing a plan to realise AND operation using NOR gate and OR operation using NAND gates only.

14. (a) Identify the logic gate whose truth table is shown in Table 1. Also draw the symbol for the same. (2 marks)

Truth Table

| A | B | X |
|---|---|---|
| 0 | 0 | 0 |
| 0 | 1 | 1 |
| 1 | 0 | 1 |
| 1 | 1 | 0 |

Table 1

(b) Represent the timing diagram for the logic gate determined in (a) showing the input and the output waveforms (3 marks)

## Section-D

*(Attempt any 1 question, each question carries 5 marks, subparts (if any) carry marks as specified in front of question statement)*

15. a)Reduce the function, specified in Truth Table 2, to its minimum SOP form by using a Karnaugh map (5 Marks)

| | Inputs | | | Output |
|---|---|---|---|---|
| S.No. | A | B | C | X |
| 0 | 0 | 0 | 0 | 1 |
| 1 | 0 | 0 | 1 | 1 |
| 2 | 0 | 1 | 0 | 0 |
| 3 | 0 | 1 | 1 | 1 |
| 4 | 1 | 0 | 0 | 1 |
| 5 | 1 | 0 | 1 | 1 |
| 6 | 1 | 1 | 0 | 0 |
| 7 | 1 | 1 | 1 | 1 |

Table 2

b) Complete the Table 3 shown below by converting the given number to each of the other number system. (5marks)

| Octal | Hexadecimal | Binary | Decimal |
|---|---|---|---|
| 37 | | 011111 | |
| | 1B | | |

Table 3

16. An Air-conditioning unit is controlled by four variables: temperature T, humidity H, the time of the day D, and day of week W. The unit is turned on under any of the following circumstances.

1. The temperature exceeds 78° F and the time of day is between 8AM and 5PM.
2. The humidity exceeds 85%, the temperature exceeds 78° F and the time of day is between 8 AM and 5PM.
3. The humidity exceeds 85%, the temperature exceeds 78° F and it is weekend.
4. It is Saturday or Sunday and humidity exceeds 85%

Write a logic expression for controlling the air conditioning unit and simplify the expression using K-Map. (you can use following abbreviations: for temperature –T, humidity-H, time of day-D) (10 marks)

DO NOT WRITE ANYTHING ON QUESTION PAPER EXCEPT ROLL NO.

Roll No.....

Total No. of Pages:02

**END TERM EXAMINATION**
**SECOND SEMESTER, 2022-23**
**22EC001-BASIC ELECTRONICS**

**Time allowed: 03 Hours**
**General Instructions:**

**Max. Marks: 60**

- **Follow the instructions given in each section.**
- **Make sure that you attempt the questions in order.**

## SECTION-A (10x2 marks=20 marks)

***(All questions are compulsory, each question carries 02 marks)***

Q1 In a common base transistor circuit, the emitter current $I_E$ is 10mA and the collector current $I_C$ is 9.8mA. Find the value of the base current $I_B$?

Q2 Resistivity decreases and conductivity increases with adding impurities in pure conductor. Comment on the relationship between resistivity and conductivity and impurities. Also discuss about the types of impurities added?

Q3 Ripple factor is an important terminology used for rectifiers. Define Ripple factor and comment upon whether this value should be high or low. Support your answers with suitable values?

Q4 Below given are the energy band diagrams of semiconductor, conductor and insulator. Identify them. Mention the values for $E_g$ in case of: semiconductor, conductor and insulator, where $E_g$ stands for forbidden energy gap.

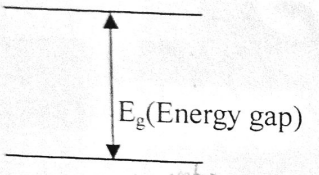


Fig. a)

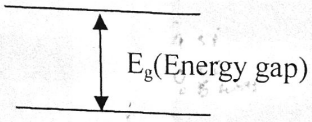


Fig. b)

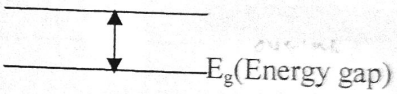


Fig. c)

Q5 Sketch the basic structure of P channel JFET? Also draw its symbol?

Q6 Convert the following: (i) $(12)_{10}$ into octal (ii) $(112)_{10}$ into hexadecimal

Q7 Complete the circuit and derive the equation of sum and carry:

| Input A | Input B | SUM | CARRY |
|---|---|---|---|
| 0 | 0 | | |
| 0 | 1 | | |
| 1 | 0 | | |
| 1 | 1 | | |

Q8 Construct the logic diagram of SR Latch using universal logic. Also draw its truth table for various conditions of input.

Q9 This diode is able to conduct only when it is sensitized to light source and usually it works in reverse biased but still large current flows as it is directly proportional to light intensity. Identify this diode and explain its working principle.

Q10 Centre tapping makes a rectifier more stable and better in terms of efficiency. Among the three rectifiers which rectifier has such phenomena? Depict it diagrammatically.

## SECTION-B (8×5 marks=40 marks)

***(Attempt any Eight Questions, each question carries 05 marks)***

Q11 A half wave rectifier has a load of 3.5KΩ. If the diode resistance and secondary coil resistance together have a resistance of 800Ω and the input voltage has a signal voltage of peak value 240 V calculate:

a) Peak, average and rms value of current flowing (1M)

b) DC power output (1M)

c) AC power input (1M)

d) Efficiency of the rectifier (2M)

Q12 Compare half wave, full wave and bridge rectifiers in terms of (i) efficiency (ii)ripple factor (iii)PIV (iv)no of diodes(v)form factor

Q13 (i) The transistor has $I_E$=10mA and alpha=0.98. Determine the values of $I_C$ and $I_B$? (2M)

(ii)With the help of suitable diagrams explain the working of N- MOSFET. (3M)

Q14 Describe the action of PN junction diode under forward bias and reverse bias.

Q15 Realize Ex- OR gate using NAND gate only.

Q16 From the truth table below determine the SOP expression and implement it using basic gates:

| Inputs | | | Output |
|---|---|---|---|
| A | B | C | X |
| 0 | 0 | 0 | 0 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 0 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 1 |
| 1 | 1 | 1 | 0 |

Q17 How many gates would be required to implement the following Boolean expression before simplification? XY+X(X+Z) +Y(X+Z)

Q18 A transistor has $I_B$=100μA and $I_C$=2mA. Find

(i) Beta (β) of the transistor (1M)

(ii) Alpha (α)of the transistor (1M)

(iii) Emitter current $I_E$ (1M)

(iv) If $I_B$ changes by +25μA and $I_C$ changes by + 0.6mA, find the new value of beta β. (2M)

Q19 A device is used to store 1 bit of data at a time. Identify the device. Explain the working of the device in terms of its (i) symbol (ii) truth table (1+4M)

Q20 (i) This theorem converts AND/multiplication (.) expression into OR/Addition (+). Identify and define the Theorem (ii) Which gates are known as Universal Gates and why? (iii) Realize AND gate using universal gates only. (2+2+1M)