

B.Sc. T. Y. (CBCS Pattern) Semester-VI  
**USDSEPHT14 - Physics Paper-II : Digital & Analog Circuits and Instrumentation**

Max. Marks : 50

Notes :

1. All questions are compulsory.
2. Draw well labelled diagram wherever necessary.
3. Scientific calculator is allowed.

**Either :**

- |           |           |      |   |          |
|-----------|-----------|------|---|----------|
| <b>1.</b> | <b>A)</b> | i)   | State and prove De-Morgan's Theorems.   | <b>4</b> |
|           |           | ii)  | Explain half adder with truth table.  | <b>2</b> |
|           |           | iii) | Explain the working of full adder with the help of block diagram and write its truth table. | <b>4</b> |

**OR**

- B)    a)    Explain how NOR gate use as universal gate. 2½
- b)    What is EX-OR gate? & write its truth table & symbol. 2½
- c)    Convert the following binary numbers to decimal equivalents. 2½
- a)     $(011011)_2$                                   b)     $(0111.1001)_2$
- d)    Explain 1's and 2's complement method with examples. 2½

**Either :**

- |           |    |      |  |          |
|-----------|----|------|--|----------|
| <b>2.</b> | A) | i)   | What is rectifier?   | <b>1</b> |
|           |    | ii)  | Explain construction & working of full wave rectifier Also Obtain the expression for its efficiency. | <b>7</b> |
|           |    | iii) | Explain $\pi$ -section filter.   | <b>2</b> |

**OR**

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|----|----|--|----|
| B) | a) | A 10 Volt Zener diode along with a series resistance is connected across a 40 Volt supply calculate the minimum value of the resistance required, if the maximum Zener current is 50 mA. | 2½ |
|    | b) | Explain working of Zener diode as a Voltage regulator.   | 2½ |
|    | c) | Explain construction and working of P-N junction diode.  | 2½ |
|    | d) | Explain the working of LED.  | 2½ |

**Either :**

3. A) i) Explain construction & working of NPN transistor. 4  
ii) With neat circuit diagram, explain the input and output characteristics of NPN transistor in common emitter mode.  
iii) Calculate  $I_E$  in a transistor for which  $\beta = 50$  And  $I_B = 30 \text{ mA}$ . 2

**OR**

- B) a) Define  $\alpha$  and  $\beta$ . Give the relationship between them.  $2\frac{1}{2}$   
b) Explain the dc load line and operating point.  $2\frac{1}{2}$   
c) Compare class A class B and class C amplifier graphically.  $2\frac{1}{2}$   
d) Explain the working of transistor as a CE amplifier by using graphical analysis.  $2\frac{1}{2}$

**Either :**

4. A) i) Explain the working of difference amplifier with neat circuit diagram. 6  
ii) Explain concept of virtual ground in Op-Amp. 2  
iii) A non-inverting amplifier has input resistance of  $4.7\text{K } \Omega$  and feedback resistance of  $47\text{K } \Omega$ . calculate the output voltage if the input voltage is  $0.7\text{V}$ . 2

**OR**

- a) Explain the application of Op-Amp as an adder.  $2\frac{1}{2}$   
b) Explain the working of Op-Amp as a non-inverting amplifier.  $2\frac{1}{2}$   
c) Explain working of Op-Amp as a differentiator.  $2\frac{1}{2}$   
d) Explain working of Op-Amp as a subtractor.  $2\frac{1}{2}$

5. Attempt **any ten** questions from the followings.

- a) What is 8421 code? 1  
b) Construct AND gate by use NAND gate. 1  
c) Simplify  $Y = \overline{\overline{A} + B}$  1  
d) Define static and dynamic resistance. 1  
e) What is depletion layer? 1  
f) Draw the circuit diagram of full wave bridge rectifier? 1  
g) What is Q-Point? 1  
h) What is amplifier? 1  
i) Draw circuit diagram for plotting the characteristics of transistor in CB mode. 1  
j) Write Characteristics of an ideal Op-Amp.  
k) Define CMRR. 1  
l) Define 1  
i) Input offset current ii) Input offset voltage.

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