

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

P. Pages : 3

Time : Three Hours



GUG/S/23/13366

Max. Marks : 50

- Notes :
1. All questions are compulsory and carry equal marks.
 2. Draw neat and labelled diagrams wherever necessary.
 3. Use of log table/ calculator is allowed.

Either:

1. A) i) Explain Half adder circuits with draw symbol, Boolean equation, truth table and logic diagram. 5
- ii) Explain full adder circuits with draw symbol, Boolean equation, truth table and logic diagram. 5

OR

- B) a) Draw symbol, Boolean equation, truth table and logic diagram of NAND. Gates. 2½
- b) Explain De-Morgan's Theorem. 2½
- c) What is EX-OR gate? Draw its logic symbol & give its truth table. 2½
- d) Subtracts the following by 9's complement method. 2½
- i) $68-53 = ?$

Either:

2. A) i) Explain the P-type and N-type semiconductor. 5
- ii) Draw and explain the forward bias? Reverse bias characteristics of PN junction diode. 5

OR

- B) a) Distinguish between Half wave, full wave and full wave bridge rectifier. 2½
- b) Explain L section filter. 2½
- c) Explain construction and working of LED. 2½
- d) Explain Zener diode is use as voltage regulator. 2½

Either:

3. A) i) What is transistor? Draw the symbols of NPN and PNP transistor. 2
- ii) Explain the working of NPN transistor. 3

- iii) Explain input and output characteristics of a transistor in CE configuration. 3
- iv) A transistor has $\alpha = 0.99$. The transistor is connected with its emitter grounded. If the base current is changed by 0.2 mA. Calculate the change in collector current. 2

OR

- B) a) Define α and β . Derive the relation $\alpha = \beta / 1 + \beta$. 2½
- b) Explain output characteristics of a transistor in CB configuration. 2½
- c) Explain the concept of dc load line and operating point. 2½
- d) In a transistor circuit the emitter and collector currents are measured at 5 mA and 4.9 mA respectively. Calculate β of the transistor. 2½

Either:

- 4. A) i) Draw the circuit diagram and explain the working of inverting amplifier using Op-Amplifier. 5
- ii) Explain the concept of virtual ground in inverting amplifier. 3
- iii) For an inverting feedback amplifier. Find the output voltage, if the input voltage is 0.6V. 2
Given : $R_1 = 10 \text{ k ohm}$ and $R_F = 5 \text{ k ohm}$.

OR

- B) a) Explain the working of Op-AMP as a adder. 2½
- b) State the characteristics of ideal operational amplifier. 2½
- c) Explain OP-amp as a Differentiator. 2½
- d) A difference amplifier has a difference mode voltage gain 100 and CMMR = 100. Calculate the output voltage. If the input voltage are $V_1 = 1 \text{ mV}$ and $V_2 = 0.9 \text{ mV}$. 2½

5. Solve **any ten** of the following.

- a) Draw symbol, Boolean equation and truth table of NOT gate. 1
- b) Write the classification of Number system. 1
- c) Perform following conversions: 1
 - i) $(2F9A)_{16} = (----)_2$
 - ii) $(CA)_{16} = (---)_{10}$
- d) What is the value of cut in voltage of Ge and Si diode? 1
- e) Define ripple factor. 1

- f) How to form depletion region in p-n junction diode. **1**
- g) Define: **1**
 - i) Cutoff region
 - ii) Saturation region
- h) Define current gain in CB mode. **1**
- i) What is transistor? **1**
- j) Define CMRR of an operational amplifier. **1**
- k) State OP-AMP as an non Inverting amplifier. **1**
- l) What is feedback? **1**
