



RAN-2103000205021005

B.Sc. (Sem. V) Examination October - 2025

Physics - Paper - X (Old)

Analog and Digital Electronics

[Total Marks: 50]

સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (2) Draw neat diagrams wherever necessary.
- (3) Symbols used in the paper have their usual meaning.
- (4) Figures to the right indicate full marks of the question.
- (5) Scientific calculator may be used.

Seat No.:

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Student's Signature

- Q-1. Answer the following questions in brief : 10**
- (1) Define SCR and MOSFET.
 - (2) Draw equivalent circuit of SCR using transistor
 - (3) Draw circuit symbol of Thyristor and UJT
 - (4) Define differential amplifier and operational amplifier
 - (5) Define CMRR and Slew rate.
 - (6) What is used inside the IEEE rectangular box to define a NAND gate?
 - (7) Write the name of special logic gate only
 - (8) How many output in magnitude comparator and mention the name of it
 - (9) Convert the binary number $(11011.101)_2$ in to its equivalent decimal number
 - (10) Define encoder and decoder in digital system
- Q-2. (a) Attempt any one of the following in details: 06**
- (1) Explain construction and working of the depletion -mode MOSFET with curves
 - (2) Explain construction and working of SCR.
- (b) Attempt any one of the following: 04**
- (1) D-MOSFET has the values $V_{gs}(\text{off}) = -3\text{V}$ and $I_{dss} = 6\text{mA}$. What will be the drain current equal when V_{gs} equals $= -1\text{v}, -2\text{v}, 0\text{v}, +1\text{v}$ and $+2\text{v}$?
 - (2) Determine R_{B1} and V_{BB} for silicon UJT if $\eta = 0.8$, $V_P = 10.3\text{v}$ and $R_{B2} = 5\text{k}\Omega$
- Q-3. (a) Attempt any one of the following in details: 06**
- (1) Write short note on DC-Analysis of differential amplifier with necessary circuit diagram and equation.
 - (2) Discuss input characteristics of an OP-AMP
 1. Input bias current
 2. Input offset current
 3. Base current and offset.
- (b) Attempt any one of the following: 04**
- (1) What are the currents and voltages in the single-ended output circuit values given below $V_{CC} = 15\text{v}$, $R_e = 7.5\text{ k}\Omega$ and $R_c = 5\text{K}\Omega$.
 - (2) Write short note on common mode gain.

- Q-4. (a) Attempt any one of the following in details: 06**
(1) Describe the karnaugh map method for simplification of Boolean function
(2) State and prove de-morgance first and second theorem using truth table.
- (b) Attempt any one of the following: 04**
(1) Write short note on product of sum (POS)
(2) A and B are two Boolean variable show that $AB + AB = AB + AB$ in Boolean algebra.
- Q-5. (a) Attempt any one of the following in details: 06**
(1) What do you mean by a 4 to 1MUX and 1 to 4 D-multiplexer? Give both logic circuit of the same.
(2) Show how a magnitude comparator works.
- (b) Attempt any one of the following: 04**
A) Write short note on parity generator and checkers.
B) Write short note on encoder in digital system.
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