

**K. J. Somaiya Institute of Technology, Sion, Mumbai-22**  
**(Autonomous College Affiliated to University of Mumbai)**

~~Nov - Dec~~ **Jan - Feb 2026**

(B. Tech ) Program: Electronics and Telecommunication Scheme III

**Supplementary** ~~Regular~~ Examination: SY Semester: III

Course Code: EXC302 and Course Name: Digital Logic Design

Date of Exam: **31-01-2026**      Duration: 02.5 Hours      Max. Marks: 60

Instructions:																													
		Max. Marks	CO	BT level																									
Q 1	Solve any <b>two</b> questions out of three: (05 marks each)	10																											
i)	For statement "A and B go to an AND1 gate; C and D go to another AND2 gate; both AND outputs go to an OR gate". Find the Boolean expression for output Y of OR gate.		2	U																									
ii)	Write SOP form of logical expression with the help of following truth table.		3	U																									
<table border="1" style="margin: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Decimal (m)</th> <th style="padding: 5px;">A</th> <th style="padding: 5px;">B</th> <th style="padding: 5px;">C</th> <th style="padding: 5px;">Y</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">3</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">1</td> <td style="text-align: center;">1</td> <td style="text-align: center;">0</td> <td style="text-align: center;">1</td> </tr> </tbody> </table>		Decimal (m)	A	B	C	Y	1	0	0	1	1	3	0	1	1	1	4	1	0	0	1	6	1	1	0	1			
Decimal (m)	A	B	C	Y																									
1	0	0	1	1																									
3	0	1	1	1																									
4	1	0	0	1																									
6	1	1	0	1																									
iii)	Explain 2 bit asynchronous (ripple) counter?		4	U																									
Q.2	Solve any <b>two</b> questions out of three: (05 marks each)	10																											
i)	a) Perform following operation using Excess-3 BCD code b) a) Add $(1111\ 0101\ 0110)_{BCD}$ and $(1111\ 0111\ 1001)_{BCD}$ and verify the result using equivalent decimal addition. c) b) Subtract $(167)_{10} - (8)_{10}$		1	A																									
ii)	Implement the Boolean function $f(A,B;C) = \sum (1,3,5,7)$ using Multiplexer.		3	C																									
iii)	Why is a debouncing circuit required in digital systems?		4	U																									
Q.3	Solve any <b>two</b> questions out of three. (10 marks each)	20																											
i)	Design 4-bit Gray to Binary converter using logic gates.		1	C																									

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ii)	Draw and explain the operation of a 4-bit Johnson (Twisted Ring) Counter with timing diagram.		4	C
iii)	Explain the function of the AND-OR structure in PAL.		5	U
Q.4	Solve any <b>two</b> questions out of three. (10 marks each)	20		
i)	Explain DeMorgans Theorem and Prove the following Boolean Expression. a) $AB.C.D + A.B.\bar{C}.\bar{D} + A.B.C.\bar{D} + A.B.\bar{C}.D + A.B.C.D.E + A.B.\bar{C}.\bar{D}.\bar{E} + A.B.\bar{C}.D.E = A.B$ b) $[A.\bar{B} + \bar{C} + \bar{D}].[D + (E + \bar{F}).G] = D.(A.\bar{B} + \bar{C}) + D.G.(E + \bar{F})$		2	A
ii)	Using the Quine-McClusky tabular method, Find the Minimum Sum-of-product for $F(A,B,C,D)=\Sigma(1,4,5,6,7,9,13)$		3	A
iii)	Write the VHDL code for a Half Adder using structural modeling.		6	U

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