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**PRESIDENCY  
UNIVERSITY  
BENGALURU**

**School of Engineering**

**Mid - Term Examination March 2026**

<b>Semester:</b> II	<b>Date:</b> 13-03-2026
<b>Course Code:</b> ECE2022	<b>Time:</b> 02:00pm – 03:30pm
<b>Course Name:</b> Digital Design	<b>Max Marks:</b> 50
<b>Program:</b> B.Tech CSE & allied	<b>Weightage:</b> 25%

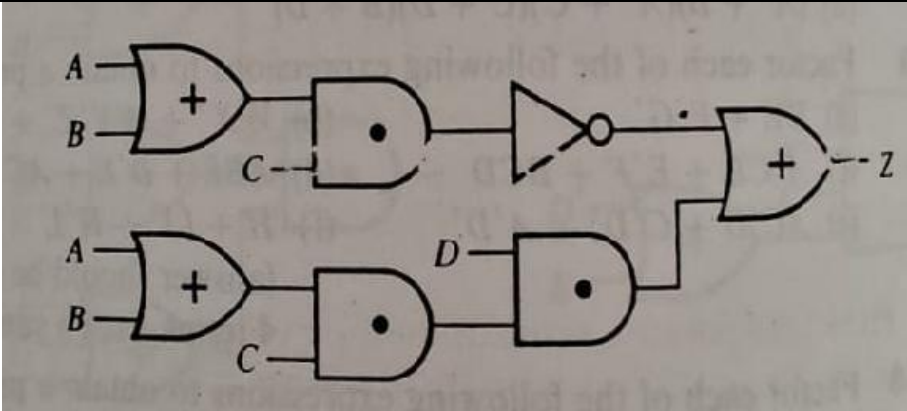
CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
<b>Marks</b>	<b>18</b>	<b>12</b>	<b>20</b>	<b>-</b>	<b>-</b>	<b>-</b>

**Part A**

<b>Answer ALL the Questions. Each question carries 2marks.</b>				<b>2Mx5Q=10M</b>	
<b>1</b>	Which are the universal gates, why they are called so?	2 Marks	L1	CO1	
<b>2</b>	Mr. X is working on a project having two bits of input data. He want to find out whether the two input bits are same or not. Which gate he is going to use?	2 Marks	L1	CO1	
<b>3</b>	Show that $XY + YZ + Y'Z = XY + Z$	2 Marks	L1	CO1	
<b>4</b>	How will you decide the number of cells required for a K map depending on the number of variables.	2 Marks	L1	CO1	
<b>5</b>	Differentiate between half adder and full adder.	2 Marks	L1	CO2	

**Part B**

<b>Answer ALL Questions. Each question carries 10 marks.</b>				<b>4QX10M=40M</b>	
<b>6</b>	a.	The Boolean expressions can be graphically represented by using logic gates. Show that $ABC + A'BC + AB'C = C(A+B)$ and obtain the basic gate implementation of the result.	5 Marks	L2	CO1
	b.	On the basis of the relationship between the input and the output, basic gates are named as AND, OR and NOT gates. Obtain the basic gate and NAND gate implementation of the term .  $AB'C + ABC' + A'BC$	5 Marks	L2	CO1

<b>Or</b>					
7	a.	Logic gates play an important role in circuit diagrams and digital systems. Explain the different basic gates with schematic, truth table and output expression.	5 Marks	L2	CO1
	b.	 <p>Any logical expressions can be implemented using basic gates. In this regard find the output expression Z for the above circuit</p>	5 Marks	L3	CO1

8	a.	A company is manufacturing only NAND gates. A project trainee who is working in this company want to work with special gates using only available NAND gate, how will he achieve the task.	5 Marks	L2	CO1
	b.	Truth table is the set of available input and output combination. Draw the truth table of the expression $(A+B)(A'C)$	5 Marks	L2	CO1

<b>Or</b>					
9	a.	De Morgan's theorem is very useful in simplifying the Boolean expressions. State and prove De Morgan's theorem using truth table for two input variables.	5 Marks	L3	CO1
	b.	Boolean algebra is applied in computer electronic circuits. Simplify the following expression by applying the Boolean laws and realize the output expression using basic gates.  $Y = ABC + A'BC + AB'C + ABC'$	5 Marks	L2	CO1

10	a.	Design a digital circuit using min-terms where inputs are Binary numbers. The output is high when Binary Coded Decimal equivalent of inputs are 0,1,2,3,4,6,9,11. We are not bothered when the inputs are 12, 13, 14 and 15. Implement the circuit using only NAND gates.	10 Marks	L3	CO1
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<b>Or</b>					
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11	a.	A Boolean expression is composed of a combination of the Boolean constants (True or False), Boolean variables and logical connectives. Solve the following expression where the output $Y = \prod M(0,2,3,6,7,8,10,12,13)$ using K-map and obtain the basic gate implementation and NAND gate implementation of the result	10 Marks	L3	CO1
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12	a.	A researcher working on a microcontroller wants to add the output of three sensors which are in digital form. He/She is having access to only basic gates. Design truth table and suitable circuit for the simplified expression to complete the task.	10Marks	L3	CO2
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**or**

13	a.	I am having the marks of two students which are in digital form. Both the marks are having two bits. I want to compare the two marks. Design a suitable truth table for greater and less than conditions and get the simplified expression using k-map. Also implement using basic gates.	10 Marks	L3	CO2
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