Roll No.											

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – December 2025	
Date: 15-12-2025	**Time:** 09.30am to 12.30pm

School : SOCSE	**Program** : B. Tech (CSE) Physics Cycle	
Course Code : ECE2022	**Course Name** : DIGITAL DESIGN	
Semester : I	**Max Marks :** 100	**Weightage**: 50%

CO - Levels	CO1	CO2	CO3	CO4	CO5	CO6
Marks	**15**	**16**	**15**	**15**	**19**	**20**

Instructions:

(i) Read all questions carefully and answer accordingly.
(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	Write the Associative law and Draw the diagram:	**2 Marks**	**L2**	**CO1**
2.	Write the truth table of the logic gate which is used for logical addition:	**2 Marks**	**L2**	**CO1**
3.	What is the complement of the Exclusive-OR (ExOR/XOR) logic function?	**2 Marks**	**L2**	**CO1**
4.	Using which universal gate, a PoS expression can be implemented with the least number of logic gates?	**2 Marks**	**L2**	**CO1**
5.	Determine the Product-of-Sums (PoS) representation for the function represented by *F= m2+ m3+ m4+m6*:	**2 Marks**	**L3**	**CO2**
6.	For the given K-map, how many Essential & Redundant Prime Implicants are present? <table><tr><td>1</td><td>1</td><td>1</td><td></td></tr><tr><td></td><td></td><td>1</td><td></td></tr></table>	**2 Marks**	**L3**	**CO2**
7.	Determine all the Selective Prime Implicants, for the Boolean function when inputs are A,B & C: <table><tr><td></td><td></td><td>1</td><td>1</td></tr><tr><td>1</td><td>1</td><td>1</td><td></td></tr></table>	**2 Marks**	**L2**	**CO2**

8.	The given Standard Boolean function is *F(W,X,Y,Z) =AD'+ B'CD'* Convert the function "F" into canonical form.	**2 Marks**	**L2**	**CO2**
9.	Write the characteristic table for D Flip-flop:	**2 Marks**	**L2**	**CO5**
10.	Write the characteristic equation for SR Flip-flop:	**2 Marks**	**L3**	**CO5**

Part B

Answer the Questions. **Total Marks 80M**

11.	**a.**	Design the following Circuit with the help of Truth Table and Boolean equation: **i)** One bit Magnitude Comparator using NAND only. **ii)** 4x1 MUX using Basic gates.	**10 Marks**	**L3**	**CO3**
		Or			
12.	**a.**	A Full Subtractor digital logic circuit, performs binary subtraction of three one-bit inputs and producing Two outputs known as Difference & Borrow. Here, you are provided with minimum numbers of Two input ExOR, Two input AND & Two input OR & NOT logic gates. Complete the following Task: **i)** Predict the Full Subtractor truth table. **ii)** Produce logic expression and restructure in terms of Half Subtractor Equations. **iii)** Sketch the circuit using available gates	**10 Marks**	**L3**	**CO3**

13.	**a.**	Implement the given Boolean function using 2x1 & 4x1 MUX: F(A,B,C,D)=∑m(1,3,4,11,12,13,14,15):	**10 Marks**	**L3**	**CO3 & CO4**
		Or			
14.	**a.**	i) Draw the logic circuit for 2 into 4 line Decoder: ii)Using Decoder design Full Adder	**10 Marks**	**L3**	**CO3 & CO4**

15.	**a.**	An automated greenhouse ventilation system is monitored by four sensors: S_smoke (A), S_temp (B), S_gas (C), and S_water (D). The ventilation fan must remain ON as long as no dangerous condition is detected. The fan must be turned OFF if any of the following fault conditions occur: i) Smoke sensor S_smoke (A) activates. ii) Temperature sensor S_temp (B) and gas sensor S_gas (C) activate simultaneously. iii) Gas sensor S_gas (C) and water sensor S_water (D) activate simultaneously. iv) Temperature, gas and water sensors S_temp, S_gas, S_water (B, C, D) all activate simultaneously. Derive the simplified Boolean expression for the fan-run signal (fan ON) and show it as a simplified Boolean formula. Implement the circuit using basic logic gates:	**10 Marks**	**L3**	**CO4**
		Or			

16.	**a.**	To determine the highest-priority interrupt request among multiple interrupt sources, priority-based encoders are used in the system. Design a Priority Encoder 4 into 2 line with valid bit.	**10 Marks**	**L3**	**CO4**

17.	**a.**	i) Draw ExOR gate, using minimum NAND gates: ii)For the given decimal number $(149)_{10}$, Calculate the equivalent Octal & Hexa number representation?	**7 Marks**	**L2**	**CO1**
	b.	Boolean Function of a digital circuit is described as $F = \pi M(3,4,5,7,9.13,14,15)$, Design the circuits with minimum sum term (Maxterm) & Implement using Basic gates: (Assume multiple input OR & AND gates are available)	**8 Marks**	**L3**	**CO2**
Or					
18.	**a.**	i) Draw AND gate Using NOR gates: ii)For the given Binary number $(10100101.011101)_2$, Calculate the equivalent Octal & Hexa number representation?	**7 Marks**	**L2**	**CO1**
	b.	A digital circuit is described by the Boolean function $F = \pi M(2,3,4,5,10,11,13,15) + DC\ (7)$. Design the circuit using the minimal Product-of-Sums (Maxterm) expression and implement it using basic logic gates. (Assume multiple-input AND and OR gates are available.)	**8 Marks**	**L3**	**CO2**

19.	**a.**	State and Explain the following for SR Flip-flop: i) Circuit Diagram ii) State Table iii) State /Next State/Characteristic Equation iv) Excitation Table	**15 Marks**	**L2**	**CO5**
Or					
20.	**a.**	With the help of circuit Diagram, derive the state table equation and Excitation table of JK flipflop:	**15 Marks**	**L2**	**CO5**

21.	**a.**	i) Using D flipflop draw the 3bit SISO shift register. ii)Using JK flip flop, Design three-bit counter to count the sequence from 000, 001…….111	**20 Marks**	**L3**	**CO6**
Or					
22.	**a.**	i) Using D flipflop draw the 3bit SIPO shift register. ii)Design Three-bit down counter, using JK flipflop with the help of state diagram and state table and flipflop input equations	**20 Marks**	**L3**	**CO6**