United College of Engineering and Research, Allahabad

Department of Computer Science & Engineering

B.Tech CSE- III Semester

Set-4

Course Name: Discrete Structure and Theory of Logic **AKTU Course Code:** KCS-303

Time: 60 Minutes **Max. Marks: 30**

- **All Questions are compulsory.**
- **All Questions carry one mark.**

Q. No.	Questions	CO
1	Which of the following sentence is a proposition? a) Get me a glass of milkshake b) God bless you! c) What is the time now? d) The only odd prime number is 2	**CO4**
2	The truth value of '4+3=7 or 5 is not prime'. a) False b) True	**CO4**
3	Which of the following option is true? a) If the Sun is a planet, elephants will fly b) 3 +2 = 8 if 5-2 = 7 c) 1 > 3 and 3 is a positive integer d) -2 > 3 or 3 is a negative integer	**CO4**
4	What is the value of x after this statement, assuming the initial value of x is 5? **'If x equals to one then x=x+2 else x=0'.** a) 1 b) 3 c) 0 d) 2	**CO4**
5	Let P: If Sahil bowls, Saurabh hits a century.; Q: If Raju bowls, Sahil gets out on first ball. Now if P is true and Q is false then which of the following can be true? a) Raju bowled and Sahil got out on first ball b) Raju did not bowled c) Sahil bowled and Saurabh hits a century d) Sahil bowled and Saurabh got out	**CO4**
6	The truth value '9 is prime then 3 is even'. a) False	**CO4**

	b) True	
7	Let P: I am in Delhi.; Q: Delhi is clean.; then q ^ p(q and p) is? a) Delhi is clean and I am in Delhi b) Delhi is not clean or I am in Delhi c) I am in Delhi and Delhi is not clean d) Delhi is clean but I am in Mumbai	**CO4**
8	Let P: This is a great website, Q: You should not come back here. Then 'This is a great website and you should come back here.' is best represented by? a) ~P V ~Q b) P ∧ ~Q c) P V Q d) P ∧ Q	**CO4**
9	Let P: We should be honest., Q: We should be dedicated., R: We should be overconfident. Then 'We should be honest or dedicated but not overconfident.' is best represented by? a) ~P V ~Q V R b) P ∧ ~Q ∧ R c) P V Q ∧ R d) P V Q ∧ ~R	**CO4**
10	Let P: I am in Bangalore.; Q: I love cricket.; then q -> p is? a) If I love cricket then I am in Bangalore b) If I am in Bangalore then I love cricket c) I am not in Bangalore d) I love cricket	**CO4**
11	Let p and q be two propositions. Consider the following two formulae in propositional logic. **S1:** (¬p∧(p∨q))→q **S2:** q→(¬p∧(p∨q)) Which one of the following choices is correct? (A) Both S1 and S2 are tautologies. (B) S1 is a tautology but S2 is not a tautology (C) S1 is not a tautology but S2 is a tautology (D) Neither S1 nor S2 is a tautology	
12	Choose the correct choice(s) regarding the following proportional logic assertion S: S:((P∧Q)→R)→((P∧Q)→(Q→R)) (A) S is neither a tautology nor a contradiction (B) S is a tautology (C) S is a contradiction	

	(D) The antecedent of S is logically equivalent to the consequent of S	

13	Consider a Boolean function f(w,x,y,z) such that
	`f(w,0,0,z) = 1`
	`f(1,x,1,z) = x+z`
	`f(w,1,y,z) = wz+y`
	The number of literals in the minimal sum-of-products expression of f is _____
	.
	(A) 6
	(B) 3
	(C) 8
	(D) 1	

14	What is the logical translation of the following statement? `"None of my friends are perfect."` (A) $\exists x(F(x)\wedge\neg P(x))$ (B) $\exists x(\neg F(x)\wedge P(x))$ (C) $\exists x(\neg F(x)\wedge\neg P(x))$ (D) $\neg\exists x(F(x)\wedge P(x))$ (A) A (B) B (C) C (D) D	
15	Which one of the following is **NOT** logically equivalent to $\neg\exists x(\forall y(\alpha)\wedge\forall z(\beta))$? (A) $\forall x(\exists z(\neg\beta)\rightarrow\forall y(\alpha))$ (B) $\forall x(\forall z(\beta)\rightarrow\exists y(\neg\alpha))$ (C) $\forall x(\forall y(\alpha)\rightarrow\exists z(\neg\beta))$ (D) $\forall x(\exists y(\neg\alpha)\rightarrow\exists z(\neg\beta))$ (A) A (B) B (C) C (D) D	
16	What is the correct translation of the following statement into mathematical logic? “Some real numbers are rational”	

	(A) $\exists x\ (\text{real}(x) \vee \text{rational}(x))$ (B) $\forall x\ (\text{real}(x) \rightarrow \text{rational}(x))$ (C) $\exists x\ (\text{real}(x) \wedge \text{rational}(x))$ (D) $\exists x\ (\text{rational}(x) \rightarrow \text{real}(x))$ (A) A (B) B (C) C (D) D	
17	Which one of the following options is CORRECT given three positive integers x, y and z, and a predicate? $P(x) = \neg(x=1) \wedge \forall y(\exists z(x=y*z) \Rightarrow (y=x) \vee (y=1))$ (A) P(x) being true means that x has exactly two factors other than 1 and x (B) P(x) is always true irrespective of the value of x (C) P(x) being true means that x is a number other than 1 (D) P(x) being true means that x is a prime number	
18	Suppose the predicate F(x, y, t) is used to represent the statement that person x can fool person y at time t. which one of the statements below expresses best the meaning of the formula $\forall x \exists y \exists t(\neg F(x, y, t))$? (A) Everyone can fool some person at some time (B) No one can fool everyone all the time (C) Everyone cannot fool some person all the time (D) No one can fool some person at some time	
19	Which one of the following is the most appropriate logical formula to represent the statement? "Gold and silver ornaments are precious". The following notations are used: G(x): x is a gold ornament S(x): x is a silver ornament P(x): x is precious (A) $\forall x(P(x) \rightarrow (G(x) \wedge S(x)))$ (B) $\forall x((G(x) \wedge S(x)) \rightarrow P(x))$ (C) $\exists x((G(x) \wedge S(x)) \rightarrow P(x)$ (D) $\forall x((G(x) \vee S(x)) \rightarrow P(x))$	

20	I. $\neg\forall x(P(x))$ II. $\neg\exists x(P(x))$ III. $\neg\exists x(\neg P(x))$ IV. $\exists x(\neg P(x))$ Which of the above two are equivalent? (A) II and IV (B) II and III (C) I and IV (D) I and III	
21	P and Q are two propositions. Which of the following logical expressions are equivalent? I. $P \vee \sim Q$ II. $\sim(\sim P \wedge Q)$ III. $(P \wedge Q) \vee (P \wedge \sim Q) \vee (\sim P \wedge \sim Q)$ IV. $(P \wedge Q) \vee (P \wedge \sim Q) \vee (\sim P \wedge Q)$ (A) All of I, II, III and IV (B) Only I, II and IV (C) Only I, II and III (D) Only I and II	
22	Let Graph(x) be a predicate which denotes that x is a graph. Let Connected(x) be a predicate which denotes that x is connected. Which of the following first order logic sentences DOES NOT represent the statement: "Not every graph is connected"? (A) $\neg\forall x(Graph(x) \Rightarrow Connected(x))$ (B) $\exists x(Graph(x) \wedge \neg Connected(x))$ (C) $\neg\forall x(\neg Graph(x) \vee Connected(x))$ (D) $\forall x(Graph(x) \Rightarrow \neg Connected(x))$ (A) A (B) B (C) C (D) D	
23	Which one of the following propositional logic formulas is TRUE when exactly two of	

	p, q, and r are TRUE? (A) $((p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$ (B) $(\sim (p \leftrightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$ (C) $((p \rightarrow q) \wedge r) \vee (p \wedge q \wedge \sim r)$ (D) $(\sim (p \leftrightarrow q) \wedge r) \wedge (p \wedge q \wedge \sim r)$ (A) A (B) B (C) C (D) D	
24	Which one of the following Boolean expressions is NOT a tautology? (A) $((a \longrightarrow b) \wedge (b \longrightarrow c)) \longrightarrow (a \longrightarrow c)$ (B) $(a \longleftrightarrow c) \longrightarrow (\backsim b \longrightarrow (a \wedge c))$ (C) $(a \wedge b \wedge c) \longrightarrow (c \vee a)$ (D) $a \longrightarrow (b \longrightarrow a)$ (A) D (B) C (C) B (D) A	
25	The CORRECT formula for the sentence, “not all rainy days are cold” (A) $\forall d\ (Rainy(d) \wedge \sim Cold(d))$ (B) $\forall d\ (\sim Rainy(d) \longrightarrow Cold(d))$ (C) $\exists d\ (\sim Rainy(d) \longrightarrow Cold(d))$ is (D) $\exists d\ (Rainy(d) \wedge \sim Cold(d))$ (A) A (B) B (C) C (D) D	

26 Which one of the first order predicate calculus statements given below correctly express the following English statement?

Tigers and lions attack if they are hungry or threatened.

(A) $\forall x\left[(\text{tiger}(x) \wedge \text{lion}(x)) \rightarrow \{(\text{hungry}(x) \vee \text{threatened}(x)) \rightarrow \text{attacks}(x)\}\right]$

(B) $\forall x\left[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow \{(\text{hungry}(x) \vee \text{threatened}(x)) \wedge \text{attacks}(x)\}\right]$

(C) $\forall x\left[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow \{\text{attacks}(x) \rightarrow (\text{hungry}(x) \vee \text{threatened}(x))\}\right]$

(D) $\forall x\left[(\text{tiger}(x) \vee \text{lion}(x)) \rightarrow \{(\text{hungry}(x) \vee \text{threatened}(x)) \rightarrow \text{attacks}(x)\}\right]$

(A) A

(B) B

(C) C

(D) D

27 Consider the following propositional statements: P1 : ((A ∧ B) → C)) ≡ ((A → C) ∧ (B → C)) P2 : ((A ∨ B) → C)) ≡ ((A → C) ∨ (B → C)) Which one of the following is true?

(A) P1 is a tautology, but not P2

(B) P2 is a tautology, but not P1

(C) P1 and P2 are both tautologies

(D) Both P1 and P2 are not tautologies

28 A logical binary relation □ ,is defined as follows:

A	B	$A \square B$
True	True	True
True	False	True
False	True	False
False	False	True

Let ~ be the unary negation (NOT) operator, with higher precedence than □.

Which one of the following is equivalent to A∧B ?

(A) (~A □ B)
(B) ~(A □ ~B)

	(C) ~(~A □ ~B) **(D)** ~(~A □ B) (A) D (B) C (C) B (D) A	
29	Let P, Q and R be three atomic prepositional assertions. Let X denote (P v Q) → R and Y denote (P → R) v (Q → R). Which one of the following is a tautology? (A) X ≡ Y (B) X → Y (C) Y → X (D) ¬ Y → X	
30	What is the first order predicate calculus statement equivalent to the following? Every teacher is liked by some student (A) ∀(x) [teacher (x) → ∃ (y) [student (y) → likes (y, x)]] (B) ∀ (x) [teacher (x) → ∃ (y) [student (y) ^ likes (y, x)]] (C) ∃ (y) ∀ (x) [teacher (x) → [student (y) ^ likes (y, x)]] (D) ∀ (x) [teacher (x) ^ ∃ (y) [student (y) → likes (y, x)]]	

Answer

1-D	2-B	3-A	4-C	5-C	6-B	7- A	8-B	9-D	10-A
11-B	12-B,D	13-A	14-D	15-A,D	16-C	17-D	18-B	19-D	20-C
21-C	22-D	23-B	24-C	25-D	26-D	27-D	28-A	29-B	30-B