SIDDHARTH GROUP OF INSTITUTIONS :: PUTTUR

Siddharth Nagar, Narayanavanam Road – 517583

QUESTION BANK (DESCRIPTIVE)

Subject with Code :DM (15A05302) **Course & Branch**: B.Tech - CSE

Year & Sem: II- B.Tech& I-Sem **Regulation:R15**

UNIT – I

MATHEMATICAL LOGIC

1. a) Explain conjuction and disjuction with suitable examples. 5M

   b) Define tautology and contradiction with examples. 5M

2. Show that (a) $(\neg P \wedge \neg Q \wedge R) \vee (Q \wedge R) \vee (P \wedge R) \Leftrightarrow R$ 5M

   (b) $(P \to Q) \to Q) \Rightarrow P \vee Q$ without constructing truth table 5M

3. a)Show that $P \to Q, P \to R, Q \to \neg R, P$ are consistent 4M

   b) Give the converse, inverse and contrapositive of the proposition $P \to (Q \wedge R)$. 3M

   c) Show that $(P \to Q) \wedge ((Q \to R) \Rightarrow (P \to Q)$ 3M

4. What is principle disjunctive normal form? Obtain the PDNF of

   $P \to ((P \to Q) \wedge \neg(\neg Q \vee \neg P))$ 10M

5. What is principle conjunctive normal form? Obtain the PCNF of

   $(\neg P \to R) \wedge (Q \leftrightarrow P)$ 10M

6. (a) Show that $S \vee R$ is a tautologically implied by

   $(P \vee Q) \wedge (P \to R) \wedge (Q \to S)$ 5M

   (b)Show that $R \wedge (P \vee Q)$ is a valid conclusion from the premises

   $P \vee Q, Q \to R, P \to M and \neg M$ 5M

7. (a) Prove that $(\exists x)(P(x) \wedge Q(x)) \Rightarrow (\exists x)(P(x) \wedge (\exists x)(Q(x)$ 5M

   (b) Show that $(\forall x)(P(x) \to Q(x)) \wedge (\forall x)(Q(x) \to R(x)) \Rightarrow (\forall x)(P(x) \to R(x))$ 5M

8. (a) Define Quantifiers and types of Quantifiers 6M

   (b) Show that $(\exists x)\, M(x)$ follows logically from the premises

   $(\forall x)(H(x) \to M(x))$ *and* $(\exists x) H(x)$ 4M

9. Use indirect method of proof to prove that

$(\forall x)(P(x) \vee Q(x)) \Rightarrow (\forall x)P(x) \vee (\exists x)Q(x)$ 10M

10. (a) Define free and bound variables for predicate calculus. 2M

(b) Show that $\neg(P \to Q) \Rightarrow \neg Q$ 2M

(c)Define NAND and NOR2M

(d)Define Exclusive disjunction with an example2M

(e) Define the conditional proposition 2M

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UNIT II

SET THEORY

1. Show that for any two sets
   (a) A∩B = B∩A 3M
   (b) A∩A = A 3M
   (c) A−(A∩B) = A−B 4M
2. (a)Let A = {x|x is an integer and 1≤x≤5} , B = { 3, 4, 5, 17}, and C = {1, 2, 3, ----- }, find A∩B, A∩C, A∪B, A∪B 5M
   (b)Let A = { 2, 3, 4}, B = { 1, 2}, and C = { 4, 5, 6}, find A + B, B + C, A + B + C 5M
3. (a) Prove that $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ 5M
   (b) Prove that $(A \cap B)' = A' \cup B')$ 5M
4. (a)Prove that Inclusion – Exclusion principle for two sets 5M
   (b) Let A and B be finite disjoint sets, then Prove that $|A \cup B| = |A| + |B|$ 5M
5. If A = {1, 2, 3}, B = {4, 5} C = {1, 2, 3, 4, 5} then prove that $(C \times B) - (A \times B) = (B \times B)$ 10M
6. (a) Find how many integers between 1 and 60 that are divisible by 2 nor by 3 and nor by 5 also determine the number of integers divisible by 5 not by 2, not by 3 5M
   (b) Prove that $A - (B \cap C) = (A - B) \cup (A - C)$ 5M
7. A survey among 100 students shows that of the three ice cream flavours vanilla, chocolate, straw berry . 50 students like vanilla, 43 like chocolate, 28 like straw berry, 13 like vanilla and chocolate, 11 like chocolate and straw berry, 12 like straw berry and vanilla and 5 like all of them. Find the following.
   1. Chocolate but not straw berry
   2. Chocolate and straw berry but not vannila
   3. Vanilla or Chocolate but not straw berry 10M
8. Let $f: A \to B$, $g: B \to C$, $h: C \to D$ then prove that $ho(gof) = (hog)of$ 10M
9. (a) If $f: R \to R$ such that f(x) = 2x+1, and $g: R \to R$ such that g(x) = x/3 then verify that $(gof)^{-1} = f^{-1}og^{-1}$ 5M

(b) Prove that for any real number x, if x is not an integer then $\lfloor x \rfloor + \lfloor -x \rfloor = -1$ 5M

10. (a) Define symmetric difference

(b) Define relation. Give an example.

(c) Define Equivalence relation

(d) Define power set. Give an example.

(e) Let R be the relation from the set A = {1, 3, 4} on itself and defined by R = { (1, 1), (1, 3), (3, 3), (4, 4)} the find the matrix of R

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UNIT I

MATHEMATICAL LOGIC

1. In the statement $P \to Q$, the statement P is called [ ]

   A) Consequent B) Antecedent C) Both A&B D)Sequent

2. What is the negation of the statement "I went to my class yesterday"[ ]

   A) I did not go to my class yesterdayB) I was absent from my class yesterday

   C) It is not the case that I went to my class yesterday D) All the above

3. Which of the following statement is well formed formula [ ]

   A) $P \to Q \to \wedge Q$ B) $(P \wedge Q) \to R$ C) $((Q \wedge (P \to Q)) \to R)$ D) None

4. $((P \to Q) \vee \neg(P \to Q)) \wedge (P \to (P \to Q)) \Leftrightarrow$ [ ]

   A) T B) F C) Contingency D) Non

5. $P \uparrow Q \Leftrightarrow$ [ ]

   A) $P \wedge Q$ B) $\neg(P \vee Q)$ C) $\neg(P \wedge Q)$ D) $P \vee Q$

6. The Rule CP is also called [ ]

   A) Contradiction of proof B) Conditional proof C) Consistency of premises D) none

7. If $H_1, H_2, ----, H_m$ are the premises and their conjunction is identically false then

   The formulas $H_1, H_2, ----, H_m$ are called [ ] A)

Consistent B) Tautology C) Inconsistent D) None

8. The α and β are string of formulas. If α and β have at least one variable in

   Common then the sequent $\alpha \xrightarrow{s} \beta$ is [ ]

   A)String of formula B)String C) Sequent D) Axiom

9. Symbolize the statement "Every apple is red" [ ]

A) $(\exists x)(A(x) \wedge R(x))$ B) $(\forall x)(A(x) \wedge R(x))$

C) $(\exists x)(A(x) \rightarrow R(x))$ D) $(\forall x)(A(x) \rightarrow R(x))$

10. $\neg(\forall x)A(x)$ [ ]

A) $(\forall x)A(x)$ B) $\neg(\exists x)A(x)$ C) $(\exists x)\neg A(x)$ D) None

11. A statement is a declarative sentence that is [ ]

A) true B) false C) true & false D) none

12. A Formula of disjunctions of minterms only is known as [ ]

A) DNF B) CNF C)PDNF D)PCNF

13. pv7p= [ ]

A) P B)T C)F D)7P

14. Let p: He is old q:He is clever, write the statement “He is old but not clever” in symbolic form [ ]

A)p^q B)p^7q C)7p^7q D)7(7p^7q)

15. The proposition p^p is equivalent to [ ]

A)1 B)p C)7p D)none

16. The connectives ^ and v are also called ------------- to each other[ ]

A)NAND B) NOR C) XOR D) dual

17. The symbolic form of “All men are mortal” where M(x):x is a men H(x):x is mortal [ ]

A)M(x)→H(x) B)(x)[M(x)→H(x)] C)(эx)(M(x)→H(x)] D)none

18. 7(p→q)= [ ]

A) 7pv7q B) p^7q C) p→q D) p→7q

19. Statement:Naveen sits between madhu and mohan is a [ ]

A) 3-place predicate B)4-place predicate C)2-place predicate D)none

20. We symbolize ”for all x” by the symbol is [ ]

A) $(\forall x)$ B) $(\exists x)$ C)[x] D) $\forall$

21. In (x)[p(x)→Q(x)] the scope of the quantifier is [ ]

A)p(x) B)Q(x)→p(x) C)p(x)→Q(x) D)none

22. (p→q)⇔[ ]

A)pvq B)pv7q C)7pvq D)none

23. If p is true , q is false then p→q is [ ]

A)true B)false C)true or flase D)none

24. p↓q <=>[ ]

A)7(pvq) B)7(p^q) C)p^q D)pvq

25. A formula consisting of a product of elementary sum is called [ ]

A)CNF B)DNF C)PDNF D)PCNF

26. 7(pvq) <=> [ ]

A)7p^7q B) 7pv7q C) p^q D) pvq

27. A proposition obtained by inserting the word not in the appropriate place is called [ ]

A) conjunction B)disjunction C) Negation D)Implication

28. p,p→q⟹[ ]

A)p B) q C) p→q D) 7p

29. p^(qvr) <=> [ ]

A) (pvq) ^(qvr) B) (pvq) ^(p ^ r) C) (p^q) v (p^r) D) (p^q) v (q^r)

30. The logical truth or a universal valid statement is called [ ]

A)contingency B)tautology C)absurdity D)contradiction

31. Implication I_{11} is [ ]

A) p,p→q=>q B) p,q=>p^q C) 7q,p→q=>p D)none

32. New propositions are obtained by the given proposition with the help of [ ]

A)conjunction B) connectives C) compound proposition D) none

33. Equivalence E_{18} is [ ]

A) p,p→q=>q B) p,q=>p^q C) 7q,p→q=>p D)none

34. R v(p^7p) <=>[ ]

A)p B) 7p C) R D) 7R

35. p^q =>[ ]

A)p B) Q C) both A and B D) none

36. In (x)[p(x) ^Q(x)] the scope of the quantifier is [ ]

A)p(x) B)Q(x) ^p(x) C)p(x) ^Q(x) D) Q(x)

37. Which of the following is contrapositive law [ ]

A) $p \to q \equiv \sim q \to \sim p$ B) $p \to q \equiv \sim q \to p$ C) $p \wedge p \equiv p$ D) none

38. Every Rectangle is a Square [ ]

A)T B) F C) both T & F D) none

39. A formula consisting of a sum of elementary productsis called [ ]

A)CNF B)DNF C)PDNF D)PCNF

40. p^7p= [ ]

A) P B)T C)F D)7P

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UNIT II

<u>SET THEORY</u>

1. Let A = {1, 2, 3, 4}. Let *f*, g and h be functions of A into R. Which one of them is one-one? [ ]

   (A) $f(1) = 3, f(2) = 4, f(3) = 5, f(4) = 3$ (B) $g(1) = 2, g(2) = 4, g(3) = 5, g(4) = 3$

   (C) h(1) = 2, h(2) =4, h(3) = 3, h(4) = 2 (D) None of above

2. Let A = [-1, 1]. Which of these functions are bijective on A? [ ]

   (A) $f(x) = x^2$ (B) $g(x) = x^3$ (C) $h(x) = x^4$ (D) None of above

3. Let S = {a, b, c, d}. Which of the following sets of ordered pairs is a function of S into S? [ ]

   (A) {(a, b), (c, a), (b, d), (d, c), (c, a)} (B) {(a, c), (b, c), (d, a), (c, b), (b, d)}

   (C) {(a, c), (b, d), (d, b)} (D) {(d, b), (c, a), (b, e), a, c)}

4. If x1=x2 => f(x1)=f(x2) then the function f is said to be [ ]

   A)injective B)surjective C)bijective D)none

5. If every element of y has the pre-image in x under the function of f then f is [ ]

   A)one-one B)on-to C)one-to-one D)none

6. If f^{-1}exits for 'f' then obviously f^{-1} is also [ ]

   A) one-one B) on-to C)one-one & on-to D)none

7. If $f(x)=x^2+1$ &$g(x)=x-1$ then fog(x)= [ ]

   A)x^2-2x+2 B)x^2-2x-2 C)x^2-2x D)none

8. A mapping I_x::x→x is called an [ ]

   A)Reflexive B)identity C)inverse D)none

9. If f:x→y is invertable the $f^{-1}$of = [ ]

   A)f B) f^{-1} C)I_x D)none

10. Associative law is [ ]
 a) A U B = B U A b) A = A c) (A U B) U C = A U (B U C)d) B = B
11. A ∩ Φ = [ ]
A) ΦB) A c) A' d)2A
12. A ∩ A = [ ]
A) Φ B) Ac) A' d) 2A
13. A U Φ = [ ]
A) Φ B) A c) A' d) 2A
14. A U A = [ ]
A) Φ B) A c) A' d) 2A
15. A U B = [ ]
A) A ∩ B B) A U A c) B U Ad) B U B
16. A relation is reflexive then there must be a [ ]
A) NodeB) loop c) vertex d) edge
17. A relation which satisfies reflexive, symmetric, & transitive is called as – [ ]
A) Equivalence B) compatibilityc) partion of set d) covering
18. If A={1,2,3,5,6} and B={ 5,6,7} then(AUB)= [ ]
 A) {1,2,3,5,6} B) { 5,6,7} C) {1,2,3,5,6,7} D) {1,2,3,4,5,6,7}
19. If A={4,5,7,8,10} and B={4,5,9} then (A-B)= [ ]
 A) {4,5,7,8,10} B) {4,5,9} C) {7, 8 ,10 } D) { 7,8,9,`10}
20. The number of elements of set is called [ ]
 A) Cardinality B) compatability C) poset D) none
21. If A={1,2,3} and B={ 5,6,7} then B -- A = [ ]
 A)B B) A C) A—B D) A ∩ B
22. If AX(B∩C)= [ ]
 A) AXBXC B) (AXB)U (AXC) C) (AXB)∩ (AXC) D)NONE
23. If n(A)=20,n(B)=30 and n(A∩B)=5 then n(AUB)= [ ]
 A) 40 B) 55 C) 45 D) 50
24. If A-(A∩B)= [ ]
 A) A –B B) A+ B C) A ∩ B D) A U A
25. If (AUB)= (AUC) and (A∩B)= (A∩C) then [ ]
 A) B = C B) A=C C) A=B D) A=B=C
26. If A={2,4,6,8,10,12} then the set builder form is [ ]
 A) { 2X/ X is natural number < 7 } B){ 2X/ X is natural number < 9 }
 C) { 2X/ X is natural number < 5 } D){ 2X/ X is natural number < 17 }
27. If U={1,2,3,4,5,6,7} find the set specified with bit string of 1010100 is [ ]

A) {1,2,3,4,5,6,7}   B){1,3,,5,}   C){1,2,3,4,} D) {1,2,3}

28. If U={a,b,c,d,e,f,g,h} find the set specified with bit string of the set A = { a,d,f,h } is [ ]

A) 10010111   B) 10010101   C) 10101010   D) 10001010

29. A Relation R in a set 'X' is ---------------- if for every x,y,z∈X and xRy∩yRz then xRz [ ]

A) Antisymmetric   B) TransitiveC) symmetric   D) none

30. Given $f(x)=x^3$ and $g(x)=x+2$, for $x\in R$ then $f\circ g$ is [ ]

A) $x+2$ B) x^3+2 C) $(x+2)^3$ D) $x-2$

31. Let $f:R\to R$ be given by $f(x)=x^3-2$. Find f^{-1} [ ]

A) $(x+2)^{\frac{1}{3}}$ B) $(x-2)^{\frac{1}{3}}$ C) x^3+2 D) x^3-3

32. The example for singleton set is [ ]

A) {1}   B) {a} C){2} D)All the above

33. If the set contains n elements, then the number of subsets is [ ]

A) n   B) n+1   C)2^n D)2^{n+1}

34. If A = {1, 3, 4} , B = {1, 2, 3, 4, 5} then [ ]

A) A = B   B) B⊆A   C)A⊆B D)None

35. The set of binary digits in tabular form is [ ]

A) {1, 1}   B) {0, 1}   C) {0, 0}   D) {0, 1, 0}

36. If B = {x / x is a multiple of 4, x is odd}, the set B is [ ]

A) Null   B) Power set   C) Empty set   D) Index set

37. If A and B are disjoint sets then A ∩ B = [ ]

A) ΦB) A   c) B   d)2A

38. AU(B∩ C) = (AUB)∩(AUC) is called [ ]

A) Commutative law   B) Associative law   C) Distributive law D) Demorgan's law

39. The family of subsets of any set is called as [ ]

A) Proper subset   B) Subset   C) Set of sets D) Power set

40. $(A\cap B)' =$ [ ]

A)A∩ BB)$A'\cap B'$ C) $A'\cup B'$ D)AU B