

Roll No. ....

Question Booklet Number

O. M. R. Serial No.

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Question Booklet Number
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**M. A./M. Sc. (Fourth Semester)**  
**(NEP) EXAMINATION, 2025-26**  
**MATHEMATICS**  
**(Advanced Discrete Mathematics) (Elective)**

Paper Code							
B	0	3	1	0	0	7	T

Questions Booklet Series
<b>B</b>

Time : 1:30 Hours ]

[ Maximum Marks : 75

**Instructions to the Examinee :**

1. Do not open the booklet unless you are asked to do so.
2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.
3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

**परीक्षार्थियों के लिए निर्देश :**

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।
2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।
3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

(Remaining instructions on the last page)

(शेष निर्देश अन्तिम पृष्ठ पर)

***(Only for Rough Work)***

1. If a lattice  $L$  is a sublattice of  $M$  and  $a, b \in L$ , then :
  - (A)  $a \vee b$  is the same in  $L$  and  $M$
  - (B)  $a \wedge b$  is the same in  $L$  and  $M$
  - (C) Both (A) and (B)
  - (D) Neither A nor B
2. The diagram showing the partial ordering relation is known as :
  - (A) Venn diagram
  - (B) Hasse diagram
  - (C) Euler diagram
  - (D) Bar chart
3. In a lattice  $(L, \leq)$ , the property  $a \vee (b \wedge c) = (a \vee b) \wedge (a \vee c)$  defines a :
  - (A) Complemented lattice
  - (B) Modular lattice
  - (C) Bounded lattice
  - (D) Distributive lattice
4. For a power set  $P(S)$  with union  $(\cup)$  and Intersection  $(\cap)$ , the “meet” operation is :
  - (A)  $A \cup B$
  - (B)  $A \cap B$
  - (C)  $A \subseteq B$
  - (D)  $A - B$
5. A partially ordered set where every pair of elements is comparable is called a :
  - (A) Lattice
  - (B) Sublattice
  - (C) Chain
  - (D) Bounded set
6. In a poset  $(S, 1)$  where  $\{1, 2, 3, 4, 6, 12, 18, 16\}$  and  $a|b$  means  $a$  divides  $b$ . what is the GLB of  $\{6, 18\}$  ?
  - (A) 2
  - (B) 3
  - (C) 18
  - (D) 6
7. Algebra of logic is termed as :
  - (A) Numerical logic
  - (B) Boolean algebra
  - (C) Arithmetic logic
  - (D) Boolean number
8. Boolean Algebra can be used :
  - (A) For designing of the digital computers
  - (B) In building logic symbols
  - (C) Circuit theory
  - (D) Building algebraic functions
9. Which value is represented by a Boolean expression :
  - (A) Positive
  - (B) Recursive
  - (C) Negative
  - (D) Boolean
10. What are the canonical forms of Boolean Expressions ?
  - (A) OR and XOR
  - (B) NOR and XNOR
  - (C) MAX and MIN
  - (D) SOM and POM

11. Which of the following is/are the universal logic gate(s) ?
- (A) OR and NOR
  - (B) AND
  - (C) NAND and NOR
  - (D) NOT
12. The logic gate that provides high output for same inputs :
- (A) NOT
  - (B) X-NOR
  - (C) AND
  - (D) XOR
13. Which of the following grammars is the most restrictive ?
- (A) Regular Grammar
  - (B) Context-Free Grammar
  - (C) Context-Sensitive Grammar
  - (D) Unrestricted Grammar
14. The language  $L = \{a^n b^n c^n \mid n \geq 1\}$  is an example of :
- (A) A Regular language
  - (B) Context-Free language
  - (C) A context-Sensitive language
  - (D) None of the above
15. The intersection of two regular language is :
- (A) Always regular
  - (B) Sometimes regular
  - (C) Never regular
  - (D) Context-free
16. A Grammar is ambiguous if :
- (A) It produces more than one language
  - (B) There is a string with more than one leftmost deviation
  - (C) It has more than one non-terminal
  - (D) The production rules are contradictory
17. According to the pumping lemma for Regular Languages, if L is regular, any string  $\omega \in L$  with length  $n$  can be split into  $xyz$  such that :
- (A)  $xy^iz \in L$ , for all  $i \geq 0$
  - (B)  $xy^iz \in L$ , for  $i = 1$  only
  - (C)  $xy^iz \notin L$
  - (D)  $xy^iz$  is a regular expression
18. Let  $(S, \cdot)$  be a semigroup and  $\sim$  be an equivalence relation on  $S$ .  $\sim$  is a congruence relation if :
- (A)  $a \sim b \Rightarrow a \cdot c \sim b \cdot c$
  - (B)  $a \sim b \Rightarrow c \cdot a \sim c \cdot b$
  - (C) Both (A) and (B)
  - (D) None of the above

19. In a quotient semigroup  $S$ , which property is inherited from the original semigroups  $S$  ?
- (A) Existence of Identity  
 (B) Commutativity  
 (C) Associativity  
 (D) Existence of Inverse
20. Let  $S = \{z^+, +\}$  and  $a \sim b$  iff  $a \equiv b \pmod{3}$ . Is  $\sim$  a congruence relation ?
- (A) Yes  
 (B) No  
 (C) Only for multiplication  
 (D) Only for subtraction
21. What is the identity element in the quotient semigroup  $(z, +)/\sim$  where  $a \sim b$  iff  $a \equiv b \pmod{n}$  ?
- (A) [1]  
 (B) [0]  
 (C) [n]  
 (D) None of the above
22. If  $\phi : S \rightarrow T$  is a semigroup homomorphism, the relation  $\sim$  defined by  $a \sim b \Leftrightarrow \phi(a) = \phi(b)$  is :
- (A) A congruence relation  
 (B) A partial order  
 (C) Not necessarily an equivalence relation  
 (D) Only symmetric
23. For a semigroup  $S$ , the intersection of any collection of congruence relation on  $S$  is :
- (A) Not a relation  
 (B) A congruence relation  
 (C) Only an equivalence relation  
 (D) A group
24. If  $(S, \cdot)$  is a commutative semigroup, the quotient semigroup  $S/\sim$  is :
- (A) Always non-commutative  
 (B) Always commutative  
 (C) A group  
 (D) A free semi-group
25. Let  $S = \{a, b, c\}$  with  $x.y = x$  for all  $x, y$ . If  $\sim$  is defined by  $a \sim b$ , the quotient semigroup  $S/\sim$  has how many elements ?
- (A) 1  
 (B) 2  
 (C) 3  
 (D) 4
26. Which of the following lattices is not distributive ?
- (A) A totally ordered set (chain)  
 (B) The power set lattice  $(P(s), \subseteq)$   
 (C) The diamond lattice  $(m_3)$   
 (D) The Boolean Algebra  $\{0, 1\}^n$

27. In a bounded distributive lattice, the complement of an element (if it exists) :
- (A) can be more than one
  - (B) is unique
  - (C) never exists
  - (D) depends on the join operation
28. A complemented lattice is a bounded lattice  $(L, \vee, \wedge, 0, 1)$ , where :
- (A) Every element has a least upper bound
  - (B) Every element has a greatest lower bound
  - (C) No element has a complement
  - (D) Every element  $a \in L$  has at least one complement  $a'$  such that  $a \vee a' = 1$  and  $a \wedge a' = 0$
29. Which of the following statements is true regarding complemented and distributive lattices ?
- (A) Every complemented lattice is distributive.
  - (B) Every distributive lattice is complemented.
  - (C) A complemented distributive lattice is a Boolean Algebra.
  - (D) Complemented lattices never have unique complements.
30. Consider the lattice of divisors of 30,  $D_{30}$ , under divisibility. Is it a complemented lattice ?
- (A) Yes, and it is distributive
  - (B) Yes, but it is not distributive
  - (C) No, it is not complemented
  - (D) It is neither complemented nor distributive
31. A lattice  $L$  is called complete if :
- (A) It is finite.
  - (B) It has a topmost element (1).
  - (C) Every subset of  $L$  has a supremum and an infimum.
  - (D) It is a chain.
32. Which of the following is an example of a complete lattice ?
- (A) The set of rational numbers  $Q$  under standard ordering
  - (B) The set of integers  $Z$  under divisibility
  - (C) The power set  $P(S)$  of any set  $S$ , under subset inclusion
  - (D) An infinite chain without a least or greatest element
33. Every finite lattice is a :
- (A) Complete lattice
  - (B) Complemented lattice
  - (C) Distributive lattice
  - (D) Boolean Algebra

34. A lattice which is both complemented and distributive is called a :
- (A) Modular lattice
  - (B) Complete lattice
  - (C) Chain
  - (D) Boolean Algebra
35. Which of the following is true regarding sublattices of a distributive lattice ?
- (A) Sublattices of distributive lattice are not necessarily distributive.
  - (B) Every sublattice of a distributive lattice is also distributive.
  - (C) Sublattices are only distributive if they are finite.
  - (D) Sublattices are only distributive if they are complete.
36. If  $B_1$  and  $B_2$  are Boolean Algebra and  $f : B_1 \rightarrow B_2$  is a Boolean Homomorphism, which of the following is true ?
- (A)  $f(x \vee y) = f(x) \wedge f(y)$
  - (B)  $f(x') = f(x)$
  - (C)  $f(x \wedge y) = f(x) \wedge f(y)$
  - (D)  $f(x) \vee f(y) = 0$
37. If  $m_i$  is a family of A-modules, the direct sum and direct product are same if :
- (A) The index set is infinite
  - (B) The set is empty
  - (C) The modules are simple
  - (D) The index set is finite
38. In a Boolean function of 3 variables  $(x, y, z)$ , which of the following is a minterm ?
- (A)  $xy + z$
  - (B)  $x + y + z$
  - (C)  $x'yz$
  - (D)  $x'y$
39. What is the sum of all minterm of a Boolean function of  $n$  variables ?
- (A) 0
  - (B) 1
  - (C)  $2^n$
  - (D)  $2^{n-1}$
40. Which Boolean expression is equivalent to  $(A + AB)$  ?
- (A)  $AB$
  - (B)  $A$
  - (C)  $B$
  - (D) 1
41. The Boolean function  $f(A, B, C) = \Sigma m(1, 2, 4, 7)$  is an example of :
- (A) Product of sums form
  - (B) Canonical SOP form
  - (C) Non-canonical SOP form
  - (D) Normalized form

42. Which of the following is not a valid Boolean law ?
- (A)  $A + 0 = A$   
 (B)  $A \cdot 1 = A$   
 (C)  $A + A' = 1$   
 (D)  $A + A = 0$
43. What is the dual of the Boolean expression  $A + 1 = 1$  ?
- (A)  $A + 0 = 0$   
 (B)  $A \cdot 1 = A$   
 (C)  $A \cdot 0 = 0$   
 (D)  $A \cdot A = A$
44. The logic gate that produces a high output only when both inputs are different is :
- (A) AND  
 (B) OR  
 (C) XOR  
 (D) XNOR
45. Give the grammar  $G : S \rightarrow aSb \mid \epsilon$ , what language does it generate ?
- (A)  $\{a^n b^m \mid n, m \geq 0\}$   
 (B)  $\{a^n b^n \mid n \geq 0\}$   
 (C)  $\{a^n b^n \mid n \geq 1\}$   
 (D)  $\{a^n b^{n+1} \mid n \geq 0\}$
46. What is the reverse Polish Notation (Postfix) for the infix expression  $A * B + C * D$  ?
- (A)  $AB * CD * +$   
 (B)  $AB + CD + *$   
 (C)  $AB * CD + *$   
 (D) None of the above
47. Convert the expression  $A + B * (C - D)$  to Polish Notation (Prefix) :
- (A)  $+ A * B - CD$   
 (B)  $+ A * B - DC$   
 (C)  $A + B * CD -$   
 (D)  $AB + CD - *$
48. Which data structure is primarily used to evaluate polish and reverse polish expression ?
- (A) Queue  
 (B) Tree  
 (C) Stack  
 (D) Linked list
49. Which of the following is the correct phrase structure rule for a noun phrase (NP) ?
- (A)  $NP \rightarrow VNP$   
 (B)  $NP \rightarrow (D)N$   
 (C)  $NP \rightarrow PNP$   
 (D)  $NP \rightarrow VPNP$
50. The postfix form of  $A * B + C/D$  is :
- (A)  $AB * CD / +$   
 (B)  $AB + CD / *$   
 (C)  $AB * CD + /$   
 (D)  $A * BC D / +$

51. Upto Isomorphism the number of abelian groups of order 108 is :
- (A) 6  
(B) 11  
(C) 9  
(D) 8
52. Let  $*$  be a binary operation on a non-empty set  $S$ . Then the pair  $(S, *)$  is called groupoid if :
- (A)  $a, b \in S \Rightarrow a * b \in S$   
(B)  $a, b \in S \Rightarrow a * b \notin S$   
(C) Both (A) and (B)  
(D) None of the above
53. The composition of two congruence relations on a set is :
- (A) Congruence relation  
(B) Not necessarily a congruence relation  
(C) Reflexive relation  
(D) None of the above
54. A map  $f : X \rightarrow Y$  is called Homomorphism from  $(X, \cdot)$  to  $(Y, *)$  if for  $a, b \in X$  :
- (A)  $f(a * b) = f(a) \cdot f(b)$   
(B)  $f(a \cdot b) = f(a) * f(b)$   
(C)  $f(a \cdot b) = f(a) - f(b)$   
(D)  $f(a * b) = f(a) + f(b)$
55. Let  $(M, *, e)$  and  $(T, \Delta, e')$  be any two monoids. Then a mapping  $f : M \rightarrow T$ , for  $a, b \in M$  is monoid homomorphism if :
- (A)  $f(a * b) = f(a) \Delta f(b)$   
(B)  $f(e) = e'$   
(C) Both (A) and (B) are true  
(D) None of the above
56. A relation  $R$  on a set  $A$  is said to be partial order relation if it is :
- (A) Reflexive  
(B) Antisymmetric  
(C) Transitive  
(D) All of the above
57. If there exists an Integer  $C$  such that  $ac = b$  and is denoted by  $a|b$ , on the set of all positive integers  $N$ , then the relation “ $a$  divides  $b$ ” is :
- (A) Partial order relation  
(B) Only Reflexive  
(C) Only Anti-symmetric  
(D) Only Transitive
58. A partially ordered set  $(L, \leq)$  is said to be Lattice, if for every  $a, b \in L$  :
- (A) Supremum  $\{a, b\}$  exist in  $L$   
(B) Infimum  $\{a, b\}$  exist in  $L$   
(C) Both Supremum and Infimum  $\{a, b\}$  exist in  $L$   
(D) None of the above

59. The set  $N$  of natural numbers under divisibility relation forms a lattice in which :
- (A)  $a \vee b = \text{lcm}(a, b)$   
 (B)  $a \wedge b = \text{gcd}(a, b)$   
 (C) Only (A) is true  
 (D) Both (A) and (B)
60. A lattice  $(L, \leq)$  is said to be complete lattice if for every subset  $A$  of  $L$  :
- (A)  $\wedge A$  exists in  $L$   
 (B)  $\vee A$  exists in  $L$   
 (C) Both (A) and (B)  
 (D) None of the above
61. In a Boolean algebra least and greatest element are respectively :
- (A) 0 and 1  
 (B) 1 and 2  
 (C) 0 and 2  
 (D) 2 and 0
62. Boolean Algebra  $B_n$  is known as switching algebra if  $B_n$  has elements :
- (A)  $n$   
 (B)  $2^n$   
 (C)  $n^2$   
 (D)  $3^n$
63. In Boolean Algebra number of complements of each element if exists, is :
- (A) Two  
 (B) Three  
 (C) Four  
 (D) Unique
64. In a Boolean Algebra  $(B, \vee, \wedge, ')$  :
- (A)  $a \vee (a' \wedge b) = a - b$   
 (B)  $a \vee (a' \wedge b) = a + b$   
 (C)  $a \vee (a' \wedge b) = a \vee b$   
 (D)  $a \vee (a' \wedge b) = a \wedge b$
65. For each element  $a$  in a Boolean Algebra :
- (A)  $(a')' = a^2$   
 (B)  $(a')' = a$   
 (C)  $(a')' = a^3$   
 (D) None of the above
66. A Grammar  $G$  is said to be type-1 if every production  $\alpha \rightarrow \beta$  has the property :
- (A)  $l(\alpha) \leq l(\beta)$   
 (B)  $l(\alpha) \geq l(\beta)$   
 (C)  $l(\alpha) > l(\beta)$   
 (D) None of the above

67. If  $R_1$  and  $R_2$  are Regular expressions, then :
- (A)  $L(R_1 + R_2) = L(R_1)$   
 (B)  $L(R_1 + R_2) = L(R_2)$   
 (C)  $L(R_1 + R_2) = L(R_1) \cap L(R_2)$   
 (D)  $L(R_1 + R_2) = L(R_1) \cup L(R_2)$
68. If  $X$  and  $Y$  are regular sets over  $\Sigma$  then which is also regular over  $\Sigma$  ?
- (A)  $X \cap Y$   
 (B)  $X \cup Y$   
 (C)  $X - Y^2$   
 (D) None of the above
69. For what value of  $P$ ,  $L = a^p$  is not regular ?
- (A)  $P = 4$   
 (B)  $P = 5$   
 (C)  $P = 35$   
 (D)  $P = 12$
70. Which type of Grammar is called context-sensitive grammar ?
- (A) Type-2  
 (B) Type-3  
 (C) Type-1  
 (D) None of the above
71. Suppose  $(S, *)$  and  $(T, \Delta)$  be any two semigroups, then a map  $f: S \rightarrow T$ , for  $a, b \in S$  is Semigroup Homomorphism if :
- (A)  $f(a * b) = f(a) \Delta f(b)$   
 (B)  $f(a * b) = f(a)$   
 (C)  $f(a * b) = f(b)$   
 (D)  $f(a * b) = f(a) + 2f(b)$
72. If  $P(S)$  be power set of a non-empty set  $S$ , then Algebraic system  $(P(S), U)$  is monoid with identity :
- (A) 0  
 (B) 2  
 (C)  $\phi$   
 (D)  $S$
73. Any Group  $(G, *)$  is abelian if :
- (A)  $a^2 = e$  with  $a = e$   
 (B)  $a^2 = e$  with  $a \neq e$   
 (C)  $a^2 = e$  with  $a = 2e$   
 (D) None of the above
74. If  $G = \langle a \rangle$  be a cyclic group of order  $n$ , then  $a^m$  is generator of  $G$  if and only if g.c.d. of  $(m, n)$  is equal to :
- (A) 0  
 (B) 2  
 (C)  $2^a$   
 (D) 1

75. A group  $G \neq \{e\}$  is known as simple group, then number of proper normal subgroups is :
- (A) 0  
(B) 1  
(C) 2  
(D) 4
76. Under which ordering relation the set of real number is a partial order relation :
- (A)  $\leq$   
(B)  $\geq$   
(C) Both (A) and (B)  
(D) None of the above
77. Let  $(p, \leq)$  be a partially ordered set. An element  $n$  in  $p$  is said to be a minimal element if for any  $x \in p$  :
- (A)  $x \leq n \Rightarrow x = n$   
(B)  $x \leq n \Rightarrow x = -n$   
(C)  $x \leq n \Rightarrow x = n^2$   
(D)  $x \leq n \Rightarrow x^2 = n$
78. The number of least upper bound if exists of a subset  $Q$  of elements of a poset :
- (A) two  
(B) three  
(C) five  
(D) unique
79. Let  $A = \{2, 3, 4, 6\}$  and Let ' $/$ ' be the divisibility relation on  $A$ . then  $(A, '/')$  is :
- (A) Poset  
(B) Lattice  
(C) Both Poset and Lattice  
(D) None of the above
80. For any  $a, b \in L$  (Lattice), then which is true ?
- (A)  $a \leq a \vee b$   
(B)  $a \geq a \vee b$   
(C)  $a \leq a \vee b^2$   
(D) None of the above
81. For every element  $a$  in a Boolean Algebra  $B$  :
- (A)  $a + 1 = a$   
(B)  $a + 1 = -a$   
(C)  $a + 1 = -1$   
(D)  $a + 1 = 1$
82. If  $a$  and  $b$  are arbitrary elements of a Boolean Algebra  $B$ , then :
- (A)  $(a + b)' = a' + b'$   
(B)  $(a + b)' = a'b'$   
(C)  $(a + b)' = a' - b'$   
(D) None of the above

83. Let  $(B, +, \cdot, ')$  be a Boolean Algebra. Then the lattice  $(B, \vee, \wedge)$ , where  $a \vee b = a + b$  and  $a \wedge b = ab$  is :
- (A) Only bounded  
 (B) Only complemented  
 (C) Only distributive  
 (D) All (A), (B) and (C)
84. A lattice is called a Boolean lattice if it is :
- (A) Only complemented  
 (B) Only distributive  
 (C) Both complemented and distributive  
 (D) None of the above
85. The minimum number of elements in a Boolean Algebra is :
- (A) 1  
 (B) 2  
 (C) 4  
 (D) 8
86. There is no Boolean Algebra containing exactly how many elements ?
- (A) 3  
 (B) 2  
 (C) 12  
 (D) None of the above
87. A Language  $L$  over an alphabet  $\Sigma$  is defined as :
- (A) A finite set of strings over  $\Sigma$   
 (B) A Infinite set of strings over  $\Sigma$   
 (C) A subset of  $\Sigma^*$   
 (D) A subset of  $\Sigma$
88. If  $\Sigma = \{a, b\}$ , which of the following is an infinite language ?
- (A)  $L = \{w \in \Sigma^* \mid |w| \leq 3\}$   
 (B)  $L = \{a^n b^n \mid n \leq 100\}$   
 (C)  $L = \{w \in \Sigma^* \mid w \text{ starts with 'a'}\}$   
 (D)  $L = \{\lambda, a, b\}$
89. In formal Language theory, the symbol  $\lambda$  is used to denote :
- (A) A non-terminal symbol  
 (B) The terminal symbol  
 (C) The empty string  
 (D) The end of a tape
90. A Grammar  $G = (V, T, P, S)$  where all production rules in  $P$  are of the form  $A \rightarrow \alpha$ , where  $A \in V$  and  $\alpha \in (V \cup T)^*$  is called :
- (A) Context-Sensitive Grammar  
 (B) Regular Grammar  
 (C) Phrase-structure Grammar  
 (D) Context-free Grammar
91. If  $f : S \rightarrow T$  is a semigroup homomorphism and  $S$  is a monoid with identity  $e_s$ , then, is  $f(e_s)$  necessarily the identity of  $T$  ?
- (A) Yes, always  
 (B) No, not necessarily  
 (C) Only if  $f$  is surjective  
 (D) Only if  $f$  is injective

92. The composition of two Homomorphisms  $f : S_1 \rightarrow S_2$  and  $g : S_2 \rightarrow S_3$  is :
- Not a homomorphism
  - A homomorphism
  - A monoid if  $f, g$  are semigroups
  - Always injective
93. A semigroup homomorphism that is both injective and surjective is called :
- Isomorphism
  - Endomorphism
  - Automorphism
  - Monomorphism
94. Let  $f : (z, +) \rightarrow (z, +)$  be defined by  $f(x) = 2x$ . This is a Homomorphism of which structure ?
- Only Group
  - Only Monoid
  - Semigroup
  - None of the above
95. Let  $S$  be a semigroup. A homomorphism  $f : S \rightarrow S$  is called :
- Epimorphism
  - Endomorphism
  - Isomorphism
  - Homomorphism
96. If  $f : M \rightarrow N$  is a monoid homomorphism and  $e_m$  is the identity in  $m$ , then  $f(e_m)$  is :
- Idempotent in  $N$
  - The identity in  $N$
  - Inverse in  $N$
  - Zero in  $N$
97. A monoid homomorphism  $f : m \rightarrow N$  between two monoids  $(m, *, e_m)$  and  $(N, \cdot, e_N)$  must satisfy :
- $f(a * b) = f(a) \cdot f(b)$  only
  - $f(e_m) = e_N$  only
  - $f(a * b) = f(a) \cdot f(b)$  and  $f(e_m) = e_N$
  - $f(e_m) = e_m$
98. Which of the following is not necessary for a mapping  $f : S \rightarrow T$  to be a semigroup homomorphism ?
- $f(a * b) = f(a) \cdot f(b)$
  - Operation preservation
  - Mapping the identity of  $S$  to identity of  $T$
  - $S$  and  $T$  are associative structures
99. A poset  $(L, \leq)$  is a lattice if and only if for every  $a, b \in L$  :
- $a \vee b$  exists
  - $a \wedge b$  exists
  - both  $a \vee b$  and  $a \wedge b$  exist
  - There is a maximal element
100. Which of the following is not necessarily a lattice ?
- Power set  $(P(S), \subseteq)$
  - $(z, \leq)$ , where  $z \rightarrow$  integers
  - Divisors of  $n$  under divisibility relation
  - All of the above

***(Only for Rough Work)***

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

- Q. 1 (A) ● (C) (D)  
 Q. 2 (A) (B) ● (D)  
 Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

**उदाहरण :**

**प्रश्न :**

- प्रश्न 1 (A) ● (C) (D)  
 प्रश्न 2 (A) (B) ● (D)  
 प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।