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India's Best Institute for IES, GATE & PSUs

Important Questions *for* GATE 2022

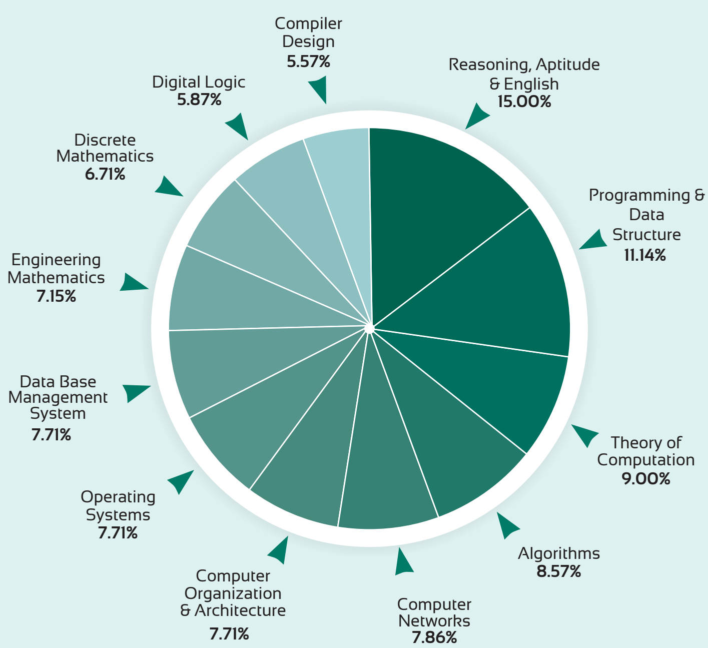
COMPUTER SCIENCE & IT

Day 5 of 8

Q.101 - Q.125 (Out of 200 Questions)

Discrete Mathematics

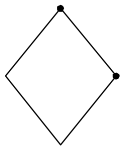
SUBJECT-WISE WEIGHTAGE ANALYSIS OF GATE SYLLABUS



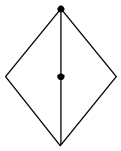
Subject	Average % (last 5 yrs)
Reasoning, Aptitude & English	15.00%
Programming & Data Structure	11.14%
Theory of Computation	9.00%
Algorithms	8.57%
Computer Networks	7.86%
Operating Systems	7.71%
Computer Organization & Architecture	7.71%
Data Base Management System	7.71%
Engineering Mathematics	7.15%
Discrete Mathematics	6.71%
Digital Logic	5.87%
Compiler Design	5.57%
Total	**100%**

Discrete Mathematics

Q.101 Which of the following lattices are complete lattices?

(a) 

(b)

(c) 

(d) All of these

Q.102 Consider the following statement over the domain of natural number.

"No prime number except 7 is divisible by 7"

Find the equivalent predicate logic for the above statement.

(a) $\forall x \in \text{N}\ [x \neq 7 \wedge \text{Prime}\ (x) \rightarrow (\neg\ \text{Divisibleby7}\ (x))]$

(b) $\neg\ \exists x \in \text{N}\ [x \neq 7 \wedge \text{Prime}\ (x) \wedge \text{Divisibleby7}\ (x)]$

(c) Both (a) and (b)

(d) None of these

Q103 Which of the following predicate arguments is valid?

(a) $\forall x\ P(x) \rightarrow \forall x[P(x) \vee Q(x)]$

(b) $\exists x\ \exists y\ P(x, y) \rightarrow \exists y\ \exists x\ P(x, y)$

(c) $\exists x\ [R(x) \vee S(x)] \rightarrow \exists x\ R(x) \vee \exists x\ S(x)$

(d) All of these

Q.104 Let G be a finite group. If A and B are subgroups of G with orders 4 and 5 respectively then $|A \cap B|$ = _______.

Q.105 Let R be a relation over the set of integers, and $(x, y) \in R$ if and only if $|x - y| \leq 2$. Then R is ________.

(a) Reflexive and transitive relation
(b) Reflexive and symmetric relation
(c) Symmetric and transitive relation
(d) Equivalence relation

Q.106 Consider the following statements:

P_1: $\exists x\ \exists y\ (x \neq y \wedge \forall z\ (\text{Apple}\ (z) \leftrightarrow ((z = x) \vee (z = y)))$

P_2: $\exists x\ \exists y\ (\text{Apple}\ (x) \wedge \text{Apple}\ (y) \wedge x \neq y) \wedge \forall x\ \forall y\ \forall z\ ((\text{Apple}\ (x) \wedge \text{Apple}\ (y) \wedge \text{Apple}\ (z)) \rightarrow (x = y \vee\ x = z \vee y = z))$

P_3: $\exists x\ \exists y\ (\text{Apple}\ (x) \wedge \text{Apple}\ (y) \wedge (x \neq y) \wedge \forall z\ (\text{Apple}\ (z) \rightarrow (z = x) \vee (z = y)))$

Which of the predicate logic statements represent the following statement.

"there are exactly two apples"

(a) P_1 and P_2 only
(b) P_1 and P_3 only
(c) P_2 and P_3 only
(d) P_1, P_2 and P_3

Q.107 Which of the following is an uncountable set?

S_1 : A = $\{x \in Q \mid -100 \le x \le 100\}$ where Q represent set of rational numbers

S_2 : B = set of all real number between (0, 0.1]

S_3 : C = $\{(x, y) \mid x \in N, y \in Z\}$ where N represent set of natural numbers and Z represent set of integers

S_4 : D = $\left\{\frac{1}{n} \middle| n \in N\right\}$

(a) S_1 and S_2 only
(b) S_2 only
(c) S_2 and S_4 only
(d) S_2 and S_3 only

Q.108 Assume among 75 children who went to an water park, where they could ride on merry-go-round, roller coaster and ferris wheel. It is known that, 20 of them had taken all 3 rides and 55 had taken atleast 2 of the 3 rides. Each ride costs ₹ 0.50 and total receipt of park is ₹ 70. How many number of children who did not try any of the rides?

(a) 10
(b) 12
(c) 15
(d) 25

Q.109 Consider $A_1, A_2, A_3, \ldots A_{45}$ are forty-five sets each having 7 elements and $B_1, B_2, B_3, \ldots B_n$ are n sets each having 4 elements. Let $\bigcup_{i=1}^{45} A_i = \bigcup_{i=1}^{n} B_i = S$ and each elements of S belongs to exactly 15 of A_i's and exactly 12 of B_i's. Then the value of n is ________ [Assume elements are not repeated]

Q.110 The number of non-negative integer solutions for following pairs of equation are ________.

$x_1 + x_2 + x_3 = 8$

and $x_1 + x_2 + x_3 + x_4 + x_5 + x_6 = 20$

Q.111 Consider a set S = {1000, 1001, 1002, ... 9999}. The numbers in set 'S' have atleast one digit as 2 and atleast one digit as 5 are ________.

Q.112 Which of the following is true?

(a) The edge uv in a simple graph G is a cut edge, if and only if $n(G) \ge d(u) + d(v)$.
(b) Every graph with fewer edge than vertices has component of a tree.
(c) If G is an Eulerian graph with edges e, e'sharing a vertex, then G has an Eulerian circuit in which e and e'appear consecutively.
(d) In connected graph G with atleast 2 vertices and $\delta(G) < \Delta(G)$ deleting a vertex of $\delta(G)$ cannot reduce the average degree.

Q.113 Which of the following is false?

(a) Every cyclic group is Abelien group.
(b) Every Abelien group is cyclic group.
(c) Every group of prime order is Abelien group.
(d) If $(G, *)$ be a cyclic group of even order, then there exist atleast one elements other than identity element such that $a^{-1} = a$.

Q.114 Consider a_n represent the number of bit string of length 'n' containing even member of 0's. What is the recurrence relation?

(a) $a_{n-2} + (2^{n-1} - a_{n-1})$
(b) $a_{n-1} + a_{n-2} + 2^{n-1}$
(c) $2a_{n-1} - a_{n-1} - a_{n-2}$
(d) $2a_{n-1}$

Q.115 The number of ways to roll 5 six sided dice to get sum of 25 is ________.

Q.116 Consider the simple graph with degree sequence {7, 3, 3, 3, 3, 3, 3, 3}. If x be the cardinality of largest independence set and y be cardinality of the minimum vertex cover, then the $x \times y$ is ________.

Q.117 Consider the following functions:

$$f(x) = \ln x + x$$
$$g(x) = x^2 \sin x$$
$$h(x) = x^3 - x$$

Which of the functions given above are many-one?

(a) $f(x)$, $g(x)$
(b) $g(x)$, $h(x)$
(c) All of the above
(d) None of these

Q.118 A graph G is said to be separable if G is either disconnected or can be disconnected by removing one vertex in G. Consider the following statements:

S_1 : Every k regular connected graph is non separable for all $k \geq 3$.

S_2 : Every k regular graph is connected.

Which of the above statement(s) is/are true?

(a) Both S_1 and S_2 only
(b) Only S_1
(c) Only S_2
(d) None of these

Q.119 Let P, Q, R, S be 4 sets respectively. Which of the following laws always holds good?

(a) P × (Q × R) = P × Q × R
(b) (P × Q) × (R × S) = P × (Q × R) × S
(c) P × Q = Q × R
(d) None of these

Q.120 Let $\lfloor x \rfloor$ denote the smallest integer greater than or equal to x and $\lceil x \rceil$ denote the greatest integer smaller than or equal to x. Consider the following statements:

$S_1 : \left\lfloor \frac{x}{2} \right\rfloor = \left\lceil \frac{x+1}{2} \right\rceil$

$S_2 : \lceil 2x \rceil = 2\lceil x \rceil$

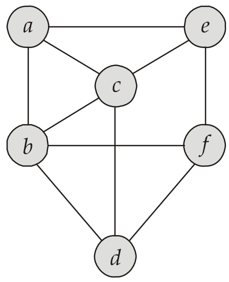
$S_3 : \lfloor \lceil x \rceil \rfloor = \lceil x \rceil$

$S_4 : \lfloor xy \rfloor = \lfloor x \rfloor \lfloor y \rfloor$

How many statements above is/are correct?

(a) 0
(b) 1
(c) 2
(d) 3

Q.121 The chromatic number of the given graph is



(a) 2
(b) 3
(c) 4
(d) 5

Q.122 Let S be a set of 5 elements:

$S = \{\alpha, \beta, \Gamma, \delta, ₹\}$

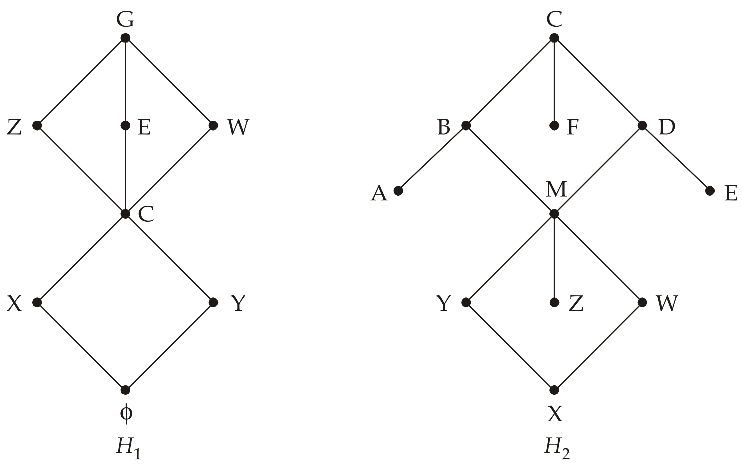
Let X be number of pairs (S_1, S_2) that satisfy following conditions.

(a) S_1 and S_2 are disjoint.

(b) $S_1, S_2 \subseteq S$

Then the value of $\log_3 X$ will be ________.

Q.123



Let X denote the number of topological orders possible in H_1. Let Y denote the number of minimal elements present in H_2. Then the value of X + 10 Y = ________.

Q.124 A simple undirected graph 'X' has 12 vertices. If 'X' has 6 equally sized connected components, the maximum number of edges in graph 'X' is ________.

Multiple Select Question (MSQ)

Q.125 Which of the following is/are true?

(a) The set of negative integers is countable.

(b) The set of integers that are multiples of 7 is countable.

(c) The set of even integers is countable.

(d) The set of real numbers between 0 and $\frac{1}{2}$ is countable.

■■■■

Detailed Explanations

101. **(d)**

If every subset of a lattice has LUB and GLB, then such a lattice is called as complete lattice.

All of the given lattices are complete lattices.

$\therefore$ Option (d) is correct.

102. **(c)**

$\forall x \in N\ [x \neq 7 \wedge \text{Prime}(x) \rightarrow \neg\ \text{Divisibleby7}(x)]$

$\cong$

$\forall x \in N\ [x = 7 \vee \neg\ \text{Prime}(x) \vee \neg\ \text{Divisibleby7}(x)]$

$\cong$

$\neg\exists x \in N\ [x \neq 7 \wedge \text{Prime}(x) \wedge \text{Divisibleby7}(x)]$

All represents that "no prime except 7 is divisible by 7".

103. **(d)**

$\forall x\ P(x) \rightarrow \forall x\ [P(x) \vee Q(x)]$ is valid

$\exists x\ \exists y\ P(x,y) \rightarrow \exists y\ \exists x\ P(x,y)$ is valid

$\exists x\ [R(x) \vee S(x)] \rightarrow \exists x\ R(x) \vee \exists x\ S(x)$ is also valid

104. **(1)**

$A \cap B = \{e\}$ where e is an identity of A and B.

$A \cap B$ is a subgroup of each of A and B.

So, order of $A \cap B$ must divided each of 4 and 5.

$\therefore$ $|A \cap B| = 1$

105. **(b)**

$|x - y| \leq 2$

$(x, x) \in R \Rightarrow |x, x| = 0 \leq 2$

So, R is reflexive

If $(x, y) \in R$ then $(y, x) \in R$

$|x - y| \leq 2 \Rightarrow |y - x| \leq 2$

So, R is symmetric

If $(x, y) \in R$ and $(y, z) \in R$ then $(x, z) \in R$

If $|x - y| \leq 2$ and $|y - z| \leq 2$ then $|x - z|$ need not be ≤ 2.

$\therefore$ R is reflexive and symmetric.

106. **(d)**

P_1, P_2 and P_3 are equivalent.

All are representing the same statement: "there are exactly two apples".

107. **(b)**

- Set A is countable. Since Q (set of rational numbers) is countable and every subset of countable set is also countable.
- Set B is uncountable. Since every subset of real number is uncountable.
- Set C is countable because it is Cartesian product of two countable sets i.e. N × Z.
- Set D is countable. Since one to one correspondence with set of natural number Cantor's theorem.

108. (a)

$$\text{Total children} = 75$$

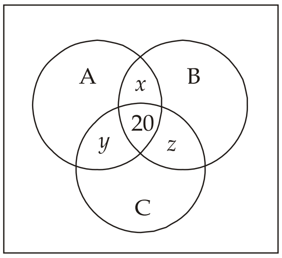
$\therefore$ Total receipt = ₹ 70 (₹ 0.50/ride)

$\therefore$ Total rides = $70 \times 2 = 140$

20 children had taken all the 3 rides

$\therefore$ 55 had taken at least 2 rides (2 or 3 rides).

So, $55 - 20 = 35$ had taken exactly 2 rides.



Let, $x + y + z = 35$

Children who had taken exactly one ride

$$\text{Total single ride} = 140 - (35 \times 2 + 20 \times 3)$$
$$= 140 - (70 + 60) = 10$$

So, total number of students who took exactly singe ride = 10

$$\text{Children who took no ride} = 75 - (35 + 20 + 10)$$
$$= 75 - (65) = 10$$

109. (63)

Total number of elements in $A_i = 45 \times 7 = 315$

Each element is used 15 times, so

$$S = \frac{315}{15} = 21$$

Similarly element in $B_i = n \times 4$

Each element is used 12 times, so

$$S = \frac{4n}{12}$$

So, $\frac{4n}{12} = 21$

$$4n = 21 \times 12$$
$$n = 21 \times 3$$
$$n = 63$$

110. (4095)

Number of solution for equation (1)

$$x_1 + x_2 + x_3 = 8$$

$$\Rightarrow \binom{8+3-1}{8}$$

$$\Rightarrow {}^{10}C_8 \Rightarrow \frac{10\times 9\times 8!}{8!\times 2!}$$

$$\Rightarrow 45$$

Number of solution for equation (2)

$$\underbrace{x_1 + x_2 + x_3}_{y_1} + x_4 + x_5 + x_6 = 20$$

$$\Rightarrow y_1 + x_4 + x_5 + x_6 = 20$$

$$\Rightarrow 8 + x_4 + x_5 + x_6 = 20$$

$$\Rightarrow x_4 + x_5 + x_6 = 12$$

$$\Rightarrow \binom{12+3-1}{12}$$

$$\Rightarrow {}^{14}C_{12} \Rightarrow \frac{14\times 13\times 12!}{12!\times 2!}$$

$$\Rightarrow 91$$

So, total number of solutions = 45 × 91 = 4095

111. (920)

$$\text{Size of (S)} = |S|$$
$$= 9999 - 1000 + 1 = 9000$$

Let X is set which do not have any '2':

$$|X| = 8 \times 9 \times 9 \times 9$$
$$= 5832$$

Let Y is set which do not have any '5':

$$|Y| = 8 \times 9 \times 9 \times 9$$
$$= 5832$$

Then $X \cap Y$ is set which does not contain any '2' and any '5':

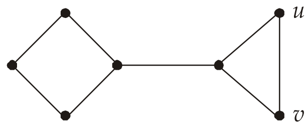
$$|X \cap Y| = 7 \times 8 \times 8 \times 8$$
$$= 3584$$

So, |having atleast one '2' and atleast one '5'|

$$= |S| - |X \cup Y|$$
$$= |S| - (|X| + |Y| - |X \cap Y|)$$
$$= 9000 - (2 \times 5832 - 3584) = 920$$

112. (b)

(a) Consider a graph:



$$n(G) \geq d(u) + d(v)$$
$$7 \geq 2 + 2$$
$$7 \geq 4$$ satisfied but u/v is not cut edge. So false

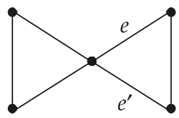
(b) Let, G be a graph such that $|E_G| < |V_G|$ further, suppose G_1, G_2, G_2 ________ G_k are connected components of G, and if no connected component of G is a tree.

Hence, for each $1 \leq i \leq k$, $|E_{Gi}| \geq |V_{Gi}|$. Thus,

$$|E_G| = \sum_{i=1}^{k} |E_{Gi}| \geq \sum_{i=1}^{k} |V_{Gi}| \geq |V_G|$$

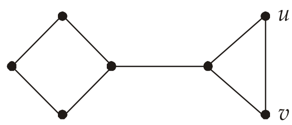
Which is a contradiction. Hence, there exists a component of G which is tree.

(c) Consider a graph:



Since graph is Eulerian graph but don't have eulerian circuit with e and e' consecutive in circuit sequence. So false

(d) Consider a graph:



Average degree $(G) = \dfrac{2e}{n}$ Average degree $(G) = \dfrac{2e}{n}$

Before removal of 'v' $= \dfrac{16}{7} = 2.285$ After removal of 'v' $= \dfrac{12}{6} = 2$

So false

113. (b)

- Every cyclic group is Abelien group but every Abelien group is not cyclic group.
- Every group of prime order is cyclic group and we know that every cyclic group is Abelien group hence, every group of prime order is Abelien group.
- If $(G, *)$ be a cyclic group of even order, then there exist atleast one elements other than identity element such that $a^{-1} = a$.

114. (d)

$$a_1 = 1 \; [\therefore \text{ strings } = 1]$$
$$a_2 = 2 \; [\therefore \text{ strings are : } 00,\ 11]$$
$$a_3 = 4 \; [\therefore \text{ strings are : } 001,\ 100,\ 111,\ 010]$$
$$a_4 = 8 \; [\therefore \text{ strings are : } 1111, 1001, 0011, 1100, 0101, 1010, 0110, 0000]$$

Option (a):

$$a_n = a_{n-2} + (2^{n-1} - a_{n-1})$$
$$\Rightarrow a_4 = a_{4-2} + 2^{4-1} - a_{4-1}$$
$$= a_2 + 2^3 - a_3 = 2 + 8 - 1 = 9 \text{ which is false.}$$

Option (b):

$$a_n = a_{n-1} + a_{n-2} + 2^{n-1}$$
$$\Rightarrow a_4 = a_3 + a_2 + 2^3$$
$$= 4 + 2 + 8 = 14 \text{ which is False.}$$

Option (c):

$$a_n = 2a_{n-1} - a_{n-1} - a_{n-2}$$
$$\Rightarrow a_4 = 2a_3 + a_3 - a_2$$
$$= 2 \times 4 - 4 + 2 = 6 \text{ which is False.}$$

Option (d):

$$a_n = 2a_{n-1}$$
$$\Rightarrow a_4 = 2a_3$$
$$= 2 \times 4 = 8 \text{ which is true.}$$

$\therefore$ Option (d): $a_n = 2a_{n-1}$ is correct.

115. (126)

Number of possible values on top of dice:

$$= x + x^2 + x^3 + x^4 + x^5 + x^6$$
$$= \frac{x(1-x^6)}{1-x}$$

We need to find coefficient of x^{25}:

$$\left(\frac{x(1-x^6)}{1-x}\right)^5 = x^5(1-x^6)^5 \cdot \frac{1}{(1-x)^5} = x^{25}$$

$\Rightarrow$ Coefficient of x^{20} in $(1-x^6)^5 \cdot \frac{1}{(1-x)^5}$

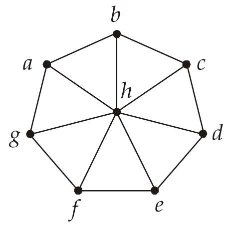
$\Rightarrow$ Coefficient of x^{20} in $(1 - 5x^6 + 10x^{12} - 10x^{18} + 5x^{24} - x^{30}) \left(\sum_{n=0}^{\infty} \binom{n+4}{4} x^n\right)$

$\Rightarrow$ Coefficient of x^{20} in $[({}^{20+4}C_4) - 5 \times ({}^{14+4}C_4) + 10 \times ({}^{8+4}C_4) - 10 \times ({}^{2+4}C_4)]x^{20}$

$$\Rightarrow \quad = ({}^{24}C_4) - 5 \times ({}^{18}C_4) + 10 \times ({}^{12}C_4) - 10 \times ({}^{6}C_4)$$
$$= 10626 - 5 \times (3060) + 10 \times (495) - 10 \times (15)$$
$$= 126$$

116. (15)

With given degree sequence, simple graph will be:



Independence set or stable set is a set of vertices in a graph, no two of which are adjacent.

So, largest independence set is $|\{a, d, f\}| = 3$

We know that,

$$\text{Total vertex} = \text{Largest independence set} + \text{Minimal vertex cover}$$
$$8 = 3 + y$$
$$y = 5$$

So, $$x \times y = 5 \times 3 = 15$$

117. (b)

There are some one way theorems for checking if a function is many one.

One of them is used here.

Theorem A function has multiple roots $\Rightarrow$ The function is many one.

[As for every root, function reaches at 0 value]

$$\begin{aligned} h(x) &= x^3 - x \\ &= x(x^2 - 1) \\ &= x(x-1)(x+1) \end{aligned}$$

So, $h(x)$ has multiple roots $\Rightarrow h(x)$ is many one.

$g(x)$ is also many one using the same property although not very obvious.

$x^2 \sin x$ will be zero (0),

If either $x^2 = 0$ or $\sin x = 0$

$$\begin{array}{cc} \Downarrow & \Downarrow \\ x = 0 & x = (\text{odd multiples of } \pi) \end{array}$$

Hence at $x = 0, \pi, 2\pi, \ldots$

$g(x)$ will be zero.

$\Rightarrow$ $g(x)$ has multiple roots $\Rightarrow g(x)$ is many one

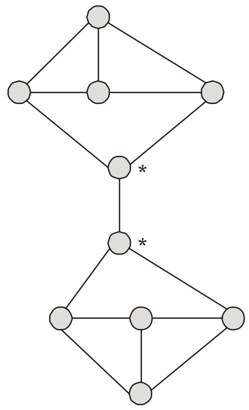
$f(x)$ is one-one. The reason is that, if a function is either strictly increasing ($\uparrow$) or strictly decreasing ($\downarrow$) then $f(x)$ is surely one-one and summation of 2 or more $\uparrow$ing functions is also $\uparrow$ing.

$$\begin{array}{ccccc} f(x) = & x & + & \ln x \\ & \Downarrow & & \Downarrow \\ & \text{Strictly} & & \text{Strictly} \\ & \uparrow\text{ing} & & \uparrow\text{ing} \\ \hline & & \Downarrow & & \\ & & \text{Strictly } \uparrow\text{ing} & & \end{array}$$

Hence answer is (b).

118. (d)

S_1 is false; here is the counter example.



Vertices marked * are cut vertices. Hence S_1 is false, as the graph above is separable.

For S_2 consider the following graph:

Given graph is 2 regular and is not a connected graph thus S_2 is also false.

119. (d)

Let's consider choice (a)

P × Q × R will have elements of the from (x, y, z) where $x \in$ P, $y \in$ Q and $z \in$ R.

However P × (Q × R) has elements of the from $(x, (y, z))$.

Moreover, P × Q × R is a triplet Cartesian product, whereas P × (Q × R) is a binary Cartesian product.

So either way it's easy to see why both aren't equal.

For option (b), take the following counter example.

Let P, Q, R, S are all ({ϕ})

(P × Q) × (R × S) will be, {((ϕ, ϕ), (ϕ, ϕ))}

And P × (Q × R) × S) will be, {(ϕ, (ϕ, ϕ), ϕ)}

Clearly both are not equal hence (b) is wrong.

(c) can only be true if either A = B or one of A and B is ϕ.

Hence (d) is the right choice.

120. (b)

Notice that we're reversed the convention for ceil and floor. Now use the usual notation for ceil and floor and flip the ones used in options, get the correct statement and mark it.

S_1: is actually $\left\lceil \frac{x}{2} \right\rceil = \left\lfloor \frac{x+1}{2} \right\rfloor$

Put $x = 2.1 \Rightarrow \text{LHS} \neq \text{RHS} \Rightarrow$ false

S_2: $\lfloor 2x \rfloor = 2\lfloor x \rfloor$

Put $x = 0.9 \Rightarrow \text{LHS} \neq \text{RHS} \Rightarrow$ false

S_4: $\lceil xy \rceil = \lceil x \rceil \lceil y \rceil$

Put $x = y = 1.1$

$$\text{LHS} = \lceil 1.21 \rceil \qquad \text{RHS} = \lceil 1.1 \rceil \lceil 1.1 \rceil$$
$$\text{LHS} = 2 \qquad\qquad = 2^2$$
$$\text{LHS} = 2 \qquad \text{RHS} = 4$$

$\text{LHS} \neq \text{RHS} \Rightarrow S_4$ is false

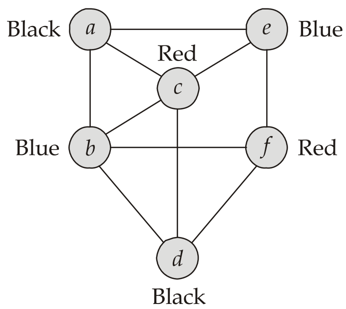
Now take S_3:

$$\lceil \underbrace{\lfloor x \rfloor}_{\text{INTEGER}} \rceil = \underbrace{\lfloor x \rfloor}_{\text{INTEGER}}$$

This will be true, because irrespective of whether x contains fractional part or not, $\lfloor x \rfloor$ will be integer and $\lceil \text{integer} \rceil$ = integer always holds true.

Hence S_3 is true.

121. (b)



Using 3 colours we can colour the above graph as shown.

Hence, answer is (b).

122. **(5)**

Possibilities:

S_1	S_2	
ϕ	Power set of {α, β, Γ, δ, ₹}	2^5
One element subsets of S	Power set of $(S - S_1)$	$^5C_1 * 2^4$
2 element subsets of S	Power set of $(S - S_1)$	$^5C_2 * 2^3$
3 element subsets of S	Power set of $(S - S_1)$	$^5C_3 * 2^2$
4 element subsets of S	Power set of $(S - S_1)$	$^5C_4 * 2^1$
5 element subsets of S	ϕ	$^5C_5 * 1$

Add these to get, $X = 243$

Now $\log_3 X = 5$

123. **(62)**

$$X = 2! \times 3! = 12$$
$$Y = 5\ (X, Z, A, F, E)$$
$$\Rightarrow \quad X + 10\,Y = 12 + 50 = 62$$

124. **(6)**

$$\text{Number of vertices} = 12$$
$$\text{Number of components} = 6$$
$$\text{Number of vertices/component} = \frac{12}{6} = 2$$

With 2 vertices, only 1 edge is possible.
So, 6 edges are there in total.

125. **(a, b, c)**

- The set of negative integers is countable.
- The set of integers that are multiples of 7 is countable.
- The set of even integers is countable.
- The set of real numbers between 0 and $\frac{1}{2}$ is countable. This is not true because we can not count set of real numbers.

■■■■