Talha Shahab

11 ± Maths Papers 2015

Q.1 Write Converse of $P \rightarrow q$.?

P	q	$P \rightarrow q$	$q \rightarrow P$
T	T	T	T
T	F	F	T
F	T	T	F
F	F	T	T

Q.2 Ans $P(x) : x > 3$

Truth value of $P(4)$

$P(4) : 4 > 3$

As it is true so the truth value of $P(4)$ is True(T).

Truth value of $P(2)$

$P(2) : 2 > 3$

since it is not true so the truth value of $P(2)$ is false (F).

Q.3 Universal Quantifiers

if $P(x)$ is a proposition which is true for all values of x then its notation will be

$\forall x, P(x)$ is true

For all

Existential Quantifiers

If $P(x)$ is a (statement) or proposition "There exist an element x in the universe of discourse such that $P(x)$ is true".

Example

$$x = \{x_1, x_2, x_3, \ldots, x_n\}$$

$$\exists x P(x) = P(x_1) \vee P(x_2) \ldots \ldots P(x_n)$$

$P(x)$ is true for some x.

Q.4 $(\sim q \vee \wedge (p \rightarrow q)) \rightarrow \sim p$

p	q	$p \rightarrow p$	$\sim q$	$p \rightarrow q$	$\sim q \wedge (p \rightarrow q)$	$(\sim q \wedge (p \rightarrow q))$
T	T	F	F	T	F	T
T	F	F	T	F	F	T
F	T	T	F	T	F	T
F	F	T	T	T	T	T

Q.5 There exist an element x,
For some values of x $(x^2 = x)$
Where x belongs to Real Numbers.

all other real numbers.

Q.6 Find Quotient & Remainde of 101 is divided by 11?

$$11 \overline{)101}\ 9,\ 99,\ 2$$

So

Quotient = 9

Remainder = 2

Q.7 what is the gcd of 45 and 60?

$45 = 3 \times 3 \times 5$

$60 = 3 \times 2 \times 2 \times 5$

$= 3 \times 5$

G.c.d = 15 Any

Q.8 since there are only 366 possible birthdays, including February 29) so in any group of 367 people there will be two people having same birthday.

Q.9

Permutation	Combination
"A permutation is an arrangement of objects in an order"	"A combination is an arrangement of objects without caring the order."
$^{n}P_{r} = \frac{n!}{(n-r)!}$	$^{n}C_{r} = \frac{n!}{(n-r)!\,r!}$

Q.10 Relation :- If A and B are two sets then any set of $A \times B$ is called relation. It is denoted by $R = \{(a,b), (c,d)\}$

Function :- Any relation is called function if

i) Domain of function = Set A

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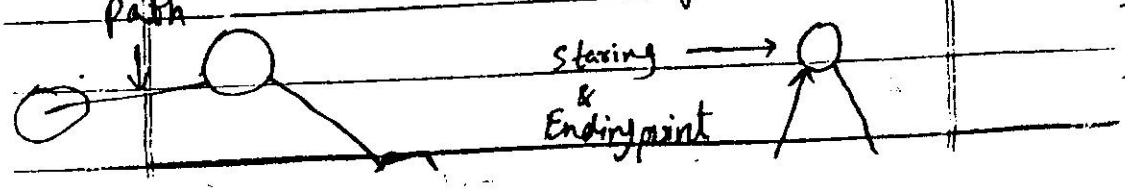
$f = \{(a,b), (c,d), (e,f)\}$

Q.11

Simple Graph	Multi-Graph
Ans A Graph which has neither loops nor multiple edges is called Simple Graph.	A Graph which Contains some multiple edges is called multi-graph. On multi-graph no loops are allowed.

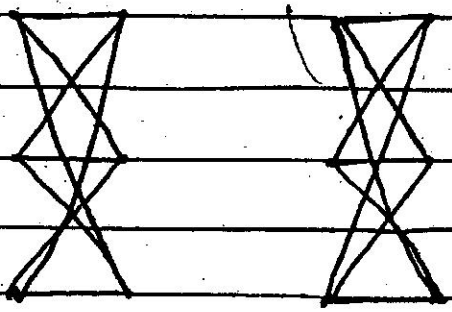
Q.12 Differentiate b/w path & circuit in a graph?

Path	Circuit
It is a sequence or line that Connects other nodes in the graph.	A circuit is also similar to path with same starting and ending points.



Q.13 Define Bipartite Graph with the help of example?

Ans A bipartite graph is also called a bigraph. It is a set of graph vertices decomposed into two disjoint sets, such that no two graph vertices with in same set are adjacent.



Q14 Onto function:- A function $f: A \rightarrow B$ is called onto function if Range of function is not repeated.

$f = \{(a,1), (b,3), (c,4)\}$

Yes it is on-to function.

Q.15 If $A=\{1,3,5\}, B=\{1,2,3\}$, Are A & B disjoint?

Ans No A & B are not disjoint sets Because more than one elements are common.

Q.16 Let $\{t_n\}$ be a sequence where $t_n = 7-3n$ what type of progression is this?

Ans This is an A.P because If we put $n = 1, 2, 3, \ldots$

$t_1 = 7-3$	$t_2 = 7-6$	$t_3 = 7-9$
$t_1 = 4$	$t_2 = 1$	$t_3 = -2$

The common differen is -3. so it is A.P.

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Subjective

I. $A=\{a,b,c,d,e\}$, $B=\{a,b,c,d,e,f,g,h\}$

(1) $B \times A$

$= \{a,b,c,d,e,f,g,h\} \times \{a,b,c,d,e,\}$

$= \{(a,a),(a,b),(a,c),(a,d),(a,e),(b,a),(b,b),$
$(b,c),(b,d),(b,e),(c,a),(c,b),(c,c),(c,d),$
$(c,e),(d,a),(d,b),(d,c),(d,d),(d,e),(e,a)$
$(e,b),(e,c),(e,d),(e,e),(f,a),(f,b),(f,c)$
$(f,d),(f,e),(g,a),(g,b),(g,c),(g,d),(g,e)$
$(h,a),(h,b),(h,c),(h,d),(h,e)\}$

(2) $A-B$

$= \{a,b,c,d,e\} - \{a,b,c,d,e,f,g,h\}$

$= \{\phi\}$ Ans

1

(ii) $\sum_{i=0}^{2} \sum_{j=0}^{3} i^2 j^3$

Q.

Sol

$= \left[(0)^2+(1)^2+(2)^2\right]\left[(0)^3+(1)^3+(2)^3+(3)^3\right]$

Ans

$= \left[1+4\right]\left[1+8+27\right]$

$= (5)(36)$

$= 180$ Ans

Q.3 $A = \{0,1,2,3,4\}$

$A \times A$

$= \{0,1,2,3,4\} \times \{0,1,2,3,4\}$

$= \{(0,0),(0,1),(0,2),(0,3),(0,4),(1,0)$
$(1,1),(1,2),(1,3),(1,4),(2,0),(2,1)$
$(2,2),(2,3),(2,4),(3,0),(3,1),(3,2)$
$(3,3),(3,4),(4,0),(4,1),(4,2),(4,3),(4,4)\}$

$R_2 = \{(0,4)(1,3)(2,2)(3,1)(4,0)\}$

$R_1 = \{(1,0)(2,0)(2,1)(3,0)(3,1)(3,2)$
$(4,0)(4,1)(4,2)(4,3)\}$

(ii) Relations for R_2

(i) Reflexive
$\{(2,2)\}$

(ii) ireflexive
$\{(0,4),(1,3),(3,1),(4,0)\}$

(iii) Symmetric
$\{(1,3),(3,1),(2,2),(0,4),(4,0)\}$

(iv) Anti-Symmetric
$\{(0,4),(4,0),(1,3),(3,1)\}$

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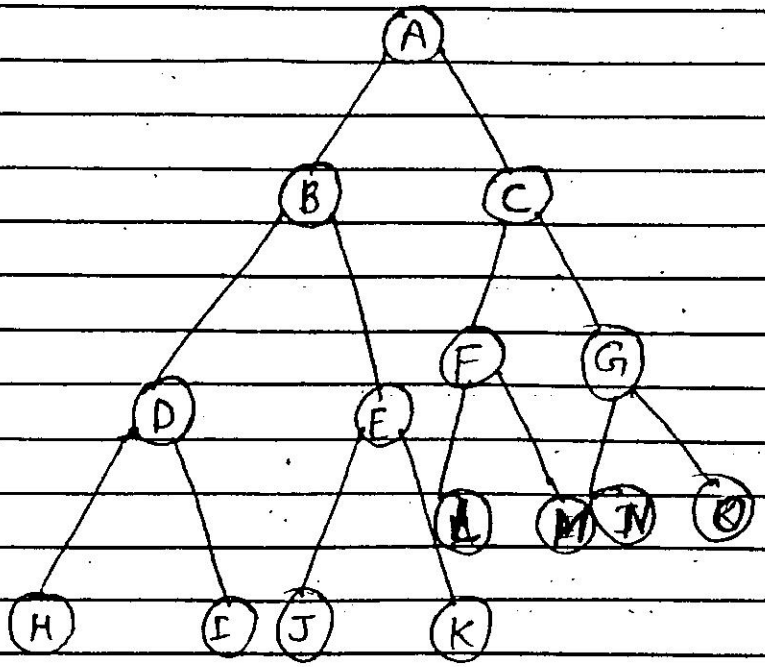
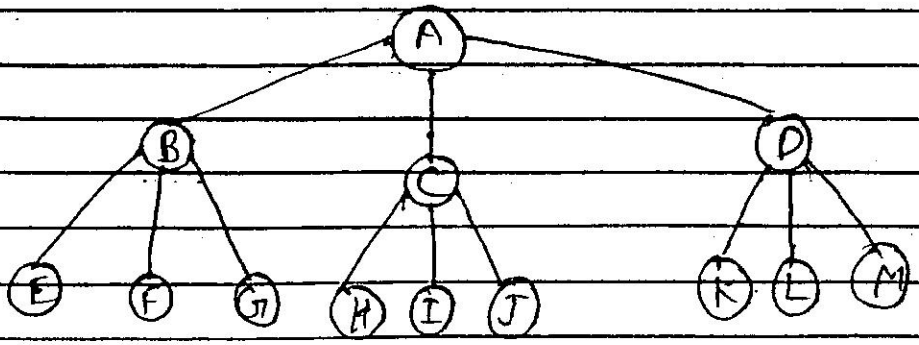
Q.

Construct a complete binary tree G of height three.

(a)



(b) 3-ary tree



Subjective

Q.6(I) How many bit strings of length 12 Contain?

(1) Exactly (3) three 1's?

Now $\binom{12}{3}$

$$= {}^{12}C_3 = \frac{12!}{(12-3)!\,3!}$$

$$= \frac{12 \times 11 \times 10 \times 9!}{9!\,(3 \times 2)}$$

$$= \frac{12 \times 110}{6}$$

$$= 220 \quad \text{Ans}$$

(2) At most three 1's.

$${}^{12}C_0 + {}^{12}C_1 + {}^{12}C_2 + {}^{12}C_3$$

$$= 1 + 12 + 66 + 220$$

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3 At least three 1's

$$2^{12} - {}^{12}C_0 - {}^{12}C_1 - {}^{12}C_2$$

$$= 2^{12} - 1 - 12 - 66$$

$$= 4017$$

4 an equal number of 0's & 1's

$${}^{12}C_6 = \frac{12!}{6!6!}$$

$$= \frac{12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6!}{6 \times 5 \times 4 \times 3 \times 2 \times 1 \times 6!}$$

$$= 11 \times 84$$

$$\rightarrow 924 \quad \text{Ans}$$

Q.
(i)
(ii)

DN

Not

Q. 11 How many license plates can be made using either two letters followed by 4 digits or two digits followed by 4 letters

Any Total Number of letters = 26

Total Number of digits = 10

I	II
Number of licence plates are of the form LLDDDD where L represents letters & D represents digits	Number of licence Plates are of the form LLLLDD. So we have Combinations
So we have Combinations $26 \times 26 = 676$	$26 \times 26 \times 26 \times 26 = 456976$
$10 \times 10 \times 10 \times 10 = 10000$	$10 \times 10 = 100$
We have 10676 Combinations available.	We have 456976 Combinations available.

NOW

Total Combinations = $10676 + 456976$

$= 467652$ Ans

Q.7 How many bit strings of length seven either begin with two 0's or end with three 1's?

Ans If the string starts with two 0's then $7 - 2 = 5$

The possible combinations will be

$2^5 = 32$ ——— (i)

If the string ends with three 1's then $7 - 3 = 4$

The possible combinations will be

$2^4 = 16$ ——— (ii)

Total Combination of bit strings = 32 + 16

= 48 Ans

Q.7 II How many positive integers less than 1000

(i) Are not divisible by 7

(ii) Are divisible by 7 and 11

I	II
Divisible by 7 = $\frac{1000}{7}$ = 142	Numbers that are divisible = $\frac{1000}{77}$