Deiva Model Question Paper - I (1)

Part - I

Choose the correct answer

1	2	3	4	5	6	7	8	9	10	11	12	13	14
b)	a)	c).	a)	a)	d)	a)	b)	d)	a)	d)	a)	c)	b)

Part - II

Answer the following :

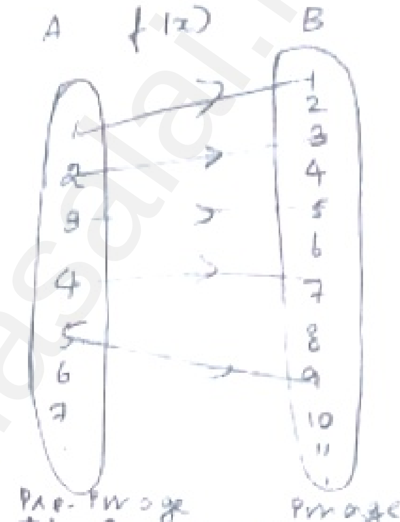
15. $A = \{2, -2, 3\}$ $B = \{1, -4\}$

$A \times B = \{2, -2, 3\} \times \{1, -4\}$

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

$B \times A = \{1, -4\} \times \{2, -2, 3\}$

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



16. $f : N \to N$

$f(x) = 2x - 1$

$f = \{1, 2, 3, 4, 5, 6, \ldots\}$

$x = 1$ $f(1) = 2(1) - 1 = 2 - 1 = 1$

$x = 2$ $f(2) = 2(2) - 1 = 4 - 1 = 3$

$x = 3$ $f(3) = 2(3) - 1 = 6 - 1 = 5$

$x = 4$ $f(4) = 2(4) - 1 = 8 - 1 = 7$

$x = 5$ $f(5) = 2(5) - 1 = 10 - 1 = 9$

It is one to one function are 2, 4, 6 has no pre-image

$\therefore$ It is not onto

17. $\frac{1}{2}, \frac{1}{6}, \frac{1}{10}, \frac{1}{14}, \ldots$

$a_5 = \frac{1}{14+4} = \frac{1}{18}$

$a_6 = \frac{1}{18+4} = \frac{1}{22}$

$a_7 = \frac{1}{22+4} = \frac{1}{27}$

18. 3^a 3^b 3^c are in G.P

a b c are in AP

t_1 t_2 t_3

$t_2 - t_1 = t_3 - t_2$

$b - a = c - b$ — ①

3^a 3^b 3^c are in G.P

$$\frac{3^b}{3^a} = \frac{3^c}{3^b}$$

$$3^{b-a} = 3^{c-b}$$

from equ ①

$$3^{c-a} = 3^{c-a}$$

3^a 3^b 3^c are in G.P

19.
$$\frac{x^3}{x-y} + \frac{y^3}{y-x}$$

$$\frac{x^3}{x-y} + \frac{y^3}{-(x-y)}$$

$$\frac{x^3}{x-y} - \frac{y^3}{x-y}$$

$$\frac{x^3 - y^3}{x-y}$$

Formula

$$(x^3 - y^3) = (x-y)(x^2+xy+y^2)$$

$$\frac{\cancel{(x-y)}(x^2+xy+y^2)}{\cancel{(x-y)}}$$

$$= x^2 + xy + y^2$$

20. $2x^2 - 2x + 9 = 0$

$a = 2$ $b = -2$ $c = 9$

$\Delta = b^2 - 4ac$

$= (-2)^2 - 4(2)(9)$

$= 4 - 72$

$= -68 < 0$

No real roots

21.
$$A = \begin{bmatrix} \sqrt{7} & -3 \\ -\sqrt{5} & 2 \\ \sqrt{3} & -5 \end{bmatrix}$$

$$-A^T = \begin{bmatrix} -\sqrt{7} & \sqrt{5} & -\sqrt{3} \\ 3 & -2 & 5 \end{bmatrix}$$

22. From the figure

$BD = 4\,cm$

$DC = 3\,cm$

$AB = 6\,cm$

$AC = ?$

$$\frac{BD}{DC} = \frac{AB}{AC}$$

$$\frac{4}{2} = \frac{6}{AC}$$

$AC\,4 = 6 \times 3$

$AC\,4 = 18$

$$AC = \frac{\cancel{18}^{9}}{\cancel{4}\,2}$$

$$AC = \frac{9}{2}$$

$AC = 4.5$

23. $m = \left(\frac{-5}{4}\right)$

$(-1, 2)$

$y - y_1 = m(x - x_1)$

$y - 2 = m(x - (-1))$

$y - 2 = \frac{-5}{4}(x+1)$

$4(y-2) = -5(x+1)$

$4y - 8 = -5x + 5$

$4y - 8 + 5x + 5$

$5x + 4y - 3 = 0$

24 $\sqrt{\frac{1+\cos\theta}{1-\cos\theta}} = \operatorname{cosec}\theta + \cot\theta$

L.H.S

$= \sqrt{\frac{1+\cos\theta}{1-\cos\theta} \times \frac{1+\cos\theta}{1+\cos\theta}}$

$(a-b)$ $(a+b)$

$= \sqrt{\frac{(1+\cos\theta)(1+\cos\theta)}{1^2 - \cos^2\theta}}$

$= \sqrt{\frac{(1+\cos\theta)^2}{\sin^2\theta}}$

$= \sqrt{\left(\frac{1+\cos\theta}{\sin\theta}\right)^{\cancel{2}}}$

$= \frac{1+\cos\theta}{\sin\theta}$

$= \frac{1}{\sin\theta} + \frac{\cos\theta}{\sin\theta}$

$= \operatorname{cosec}\theta + \cot\theta = R.H.S$

Hence Proved.

25. Radius $r = 7$ cm

TSA of cone $= 704\ cm^2$

$\pi r(l + r) = 704$

$\frac{22}{\cancel{7}} \times \cancel{7}(l+7) = 704$

$22 \times (l + 7) = 704$

$l + 7 = \frac{\cancel{704}^{32}}{\cancel{22}_1}$

$l + 7 = 32$

$l = 32 - 7$

$l = 25$ cm

Slant height $= 25$ cm

26. Height $h = 2m$

Base area $= 250\ m^2$

$\pi r^2 = 250$

volume of a cylinder $=$

$\pi r^2 h$ cu.units

$= 250 \times 2$

$= 500\ m^3$

27. 63, 89, 98, 125, 79, 108, 117, 68

$L - S = 125 - 63 = 62$

Co efficient of range $= \frac{L-S}{L+S}$

$= \frac{125-63}{125+63}$

$= \frac{62}{188}$

$= 0.33$

28. T.S.A of Solid Sphere = T.S.A of solid hemisphere

$4\pi R^2 = 3\pi r^2$

$4R^2 = 3r^2$

$\frac{4R^2}{3} = r^2$

$\sqrt{\frac{4R^2}{3}} = \sqrt{r^2}$

$r = \frac{2R}{\sqrt{3}}$ — (1)

$V_1 : V_2 = \frac{V_1}{V_2}$

$= \frac{\frac{4}{3}\pi R^3}{\frac{2}{3}\pi r^3}$

$= \frac{2R^3}{r^3}$ → equ (1) $\frac{2R}{\sqrt{3}}$

$2 \times 2 \times 2 = 8$

$\sqrt{3} \times \sqrt{3} \times \sqrt{3} = 3\sqrt{3}$

$= \frac{2R^3}{\frac{8R^3}{3\sqrt{3}}}$

$= \frac{1}{\frac{4}{3\sqrt{3}}}$

$= \frac{3\sqrt{3}}{4}$

$V_1 : V_2 = 3\sqrt{3} : 4$ Hence proved

Part - III

Answer the following

29. $A = \{0, 1\}$

$B = \{2, 3, 4\}$

$C = \{3, 5\}$

$A \times (B \cup C) = (A \times B) \cup (A \times C)$

L.H.S $(B \cup C) = \{2, 3, 4, 5\}$

$A \times (B \cup C) = \{0, 1\} \times \{2, 3, 4, 5\}$

$= \{(0,2)(0,3)(0,4)(0,5)(1,2)(1,3)(1,4)(1,5)\}$ — (1)

R.H.S

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

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

$A \times C = \{0, 1\} \times \{3, 5\}$

$= \{(0,3), (0,5), (1,3)(1,5)\}$

$(A \times B) \cup (A \times C) = \{(0,2)(0,3)(0,4)(0,5)(1,2)(1,3)(1,4)(1,5)\}$ — (2)

L.H.S = R.H.S

From (1) and (2)

We have Hence they Verified

30. $f(x) = x - 1$ $g(x) = 3x + 1$

$h(x) = x^2$ $(f \circ g) \circ h = f \circ (g \circ h)$

L.H.S

$f \circ g = f(g(x))$

$= f(3x+1)$

$= 3x + 1 - 1$

$= 3x$

$(f \circ g) \circ h = (f \circ g) x^2$

$= 3x^2$ — (1)

R.H.S

$g \circ h = g(h(x))$

$= g(x^2)$

$= 3(x^2) + 1$

$= 3x^2 + 1$

$f \circ (g \circ h) = f \circ (3x^2 + 1)$

$= 3x^2 + 1 - 1$

$= 3x^2$ — (2) Hence they Proved

5

31. 300 and 600

301, 308, ... 595

$a = 301$ $d = 308 - 301$ $d = 7$

$l = 595$

$n = \left(\frac{l-a}{d}\right) + 1$

$n = \left(\frac{595-301}{7}\right) + 1$

$$\begin{array}{r} 595 \\ 301 \\ \hline 294 \end{array}$$

$n = \left(\frac{\cancel{294}^{42}}{\cancel{7}_1}\right) + 1$

$n = 42 + 1$

$n = 43$

$S_n = \frac{n}{2}[a + l]$

$= \frac{43}{2}[301 + 595]$

$$\begin{array}{r} 595 \\ 301 \\ \hline 896 \end{array}$$

$= \frac{43}{\cancel{2}_1}[\cancel{896}^{448}]$

$= 43[448]$

$$\begin{array}{r} 448 \times 43 \\ \hline 1344 \\ 1792 \\ \hline 19264 \end{array}$$

$= 19264$

32. $3x - 2y + z = 2$ —(1)

$2x + 3y - z = 5$ —(2)

$x + y + z = 6$ —(3)

From (1) and (2)

$3x - 2y + \cancel{z} = 2$

$2x + 3y - \cancel{z} = 5$

$5x + y = 7$ —(4)

From (2) and (3)

(2) ⇒ $2x + 3y - \cancel{z} = 5$

(3) ⇒ $x + y + \cancel{z} = 6$

$3x + 4y = 11$ —(5)

From (4) and (5)

(4) × 4 ⇒ $20x + 4y = 28$

(5) ⇒ $\underset{(-)}{3x} \underset{(-)}{+4y} = \underset{(-)}{11}$

$17x = 17$

$x = \frac{\cancel{17}^1}{\cancel{17}}$

$\boxed{x = 1}$

Substitude $x = 1$ in equation (5)

$3(1) + 4y = 11$

$3 + 4y = 11$

$4y = 11 - 3$

$4y = 8$

$y = \frac{\cancel{8}^2}{\cancel{4}_1}$ $\boxed{y = 2}$

Substitute $y = 2$ in equation (3)

$1 + 2 + z = 6$

$3 + z = 6$

$z = 6 - 3$

$\boxed{z = 3}$

Therefore.

$x = 1$, $y = 2$, $z = 3$

33. $4x^4 - 12x^3 + 37x^2 + bx + a$

$$\begin{array}{r|l} & 2x^2 - 3x + 7 \\ \hline 2x^2 & 4x^4 - 12x^3 + 37x^2 + bx + a \\ & \underset{(-)}{4x^4} \\ \hline 4x^2 - 3x & -12x^3 + 37x^2 \\ & \underset{(+)}{-12x^3} + \underset{(-)}{9x^2} \\ \hline 4x^2 - 6x + 7 & 28x^2 + bx + a \\ & \underset{(-)}{28x^2} \underset{(+)}{- 42x} \underset{(-)}{+ 49} \\ \hline & 42x - 49 \end{array}$$

$b + 42 = 0$

$\boxed{b = -42}$

$a - 49 = 0$

$\boxed{a = 49}$

$a = 49$

$b = -42$

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40.

x	4	6	8	10	12
f	7	3	5	9	5

x_i	f_i	$d_i = x_i - A$	$f_i d_i$	$f_i d_i^2$
4	7	-4	-28	112
6	3	-2	-6	12
8	5	0	0	0
10	9	2	18	36
12	5	4	20	80

$N = 29$ $\quad \Sigma f_i d_i = 4$ $\quad \Sigma f_i d_i^2 = 240$

$$\sigma = \sqrt{\frac{\Sigma f_i d_i^2}{N} - \left[\frac{\Sigma f_i d_i}{N}\right]^2}$$

$$= \sqrt{\frac{240}{9} - \left[\frac{4}{29}\right]^2}$$

$$= \sqrt{\frac{240 \times 29 - 16}{29 \times 29}}$$

$$\sigma = \sqrt{\frac{6944}{29 \times 29}} \Rightarrow \frac{83.3}{29}$$

$\sigma \simeq 2.87$

83.3; 69.44; 64; 163 | 544; 489; 1663 | 5500; 4989

41. $S = \{(1,1)(1,2)(1,3)(1,4)(1,5)(1,6)$
$(2,1)(2,2)(2,3)(2,4)(2,5)(2,6)$
$(3,1)(3,2)(3,3)(3,4)(3,5)(3,6)$
$(4,1)(4,2)(4,3)(4,4)(4,5)(4,6)$
$(5,1)(5,2)(5,3)(5,4)(5,5)(5,6)$
$(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)\}$

$n(S) = 36$

$A = \{(2,1)(2,2)(2,3)(2,4)(2,5)(2,6)$
$(4,1)(4,2)(4,3)(4,4)(4,5)(4,6)$
$(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)\}$

$P(A) = \frac{n(A)}{n(S)} = \frac{18}{36} = \frac{1}{2}$

$B = \{(2,6)(3,5)(4,4)(5,3)(6,2)\}$

$P(B) = \frac{n(B)}{n(S)} = \frac{5}{36}$

$A \cap B = \{(2,6)(4,4)(6,2)\}$

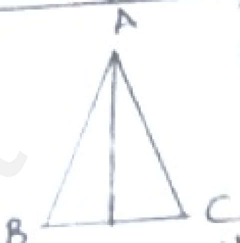
$P(A \cap B) = \frac{n(A \cap B)}{n(S)} = \frac{3}{36} = \frac{1}{12}$

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$= \frac{18}{36} + \frac{5}{36} - \frac{3}{36} \Rightarrow \frac{20}{36} \Rightarrow \frac{5}{9}$

42. $8x + 3y = 18$
$4x + 5y = 9 \;(\times 2)$

$8x + 3y = 18$
$8x + 10y = 18$
$-7y = 0$
$y = 0$ $\quad (5,-4) \quad (-7,6)$



$4x + 5y = 9$
$4x + 5(0) = 9$
$4x = 9$
$x = \frac{9}{4}$ $\quad \left(\frac{9}{4}, 0\right)$

$(5,-4)\ (-7,6)$

Mid point $\left(\frac{5-7}{2}, \frac{-4+6}{2}\right)$

$= \left(\frac{-2}{2}, \frac{2}{2}\right)$

$= (-1, 1)$

$\left(\frac{9}{4}, 0\right) \quad (-1, 1)$

$$\frac{y - y_1}{y_2 - y_1} = \frac{x - x_1}{x_2 - x_1}$$

$$\frac{y - 0}{1 - 0} = \frac{x - \frac{9}{4}}{-1 - \frac{9}{4}}$$

$$\frac{y}{1} = \frac{\frac{4x-9}{4}}{\frac{-4-9}{4}}$$

$$\frac{y}{1} = \frac{4x-9}{-13}$$

$-13y = 4x - 9$

$4x + 13y - 9 = 0$

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