

FTJ

FIRST MID TERM TEST - 2022**10 - STD****MATHEMATICS**

Time : 1.30 hrs.

Dharmapuri

--	--	--	--	--	--

Marks : 50

PART - I**i) Answer all the questions.****ii) Choose the most appropriate answer and write the option code and the corresponding answer.** $7 \times 1 = 7$

1. If there are 1024 relations form a set $A=\{1,2,3,4,5\}$ to a set B, then the number of elements in B is

a) 3	b) 2	c) 4	d) 8
------	------	------	------
2. If $\{(a,8), (6, b)\}$ represents an identify function then the value of 'a' and 'b' are respectively

a) (8,6)	b) (8,8)	c) (6,8)	d) (6,6)
----------	----------	----------	----------
3. Let $f(x) = \sqrt{1+x^2}$ then

a) $f(xy) = f(x).f(y)$	b) $f(xy) > f(x).f(y)$
c) $f(xy) < f(x).f(y)$	d) none of these
4. If $f(x) = 2-3x$, then $f.f(1-x)$ is

a) $9x - 5$	b) $5x - 9$	c) $5x + 9$	d) $5 - 9x$
-------------	-------------	-------------	-------------
5. The sum of the exponents of the prime factors in the prime factorization of 1729 is

a) 1	b) 2	c) 3	d) 4
------	------	------	------
6. The next term of the sequence $\frac{3}{16}, \frac{1}{8}, \frac{1}{12}, \frac{1}{18}, \dots$ is

a) $\frac{1}{24}$	b) $\frac{1}{27}$	c) $\frac{2}{3}$	d) $\frac{1}{81}$
-------------------	-------------------	------------------	-------------------
7. Find the sum of $2 + 3 + 4 + \dots + 15$ is

a) 225	e) 15	c) 120	d) 119
--------	-------	--------	--------

PART - II**i) Answer any 5 questions.****ii) Question No.14 is compulsory.** $5 \times 2 = 10$

8. A relation R is given by the set $\{(x,y) / y = x + 3, x \in \{0,1,2,3,4,5\}\}$. Determine its domain and range.

9. Represent the function $f(x) = \sqrt{2x^2 - 5x + 3}$ as a composition of two functions.
10. Define : Constant function.
11. 'a' and 'b' are two positive integers such that $a^b \times b^a = 80^0$.
Find 'a' and 'b'.
12. Which term of an A.P. 16, 11, 6, 1 is - 54?
13. Find the sum to infinity of $16 + 8 + 4 + \dots$
14. Solve : $5x \equiv 4 \pmod{6}$.

PART - III**i) Answer any 5 questions only.** **$5 \times 5 = 25$** **ii) Question No. 21 is compulsory.**

15. Given $A = \{1, 2, 3\}$, $B = \{2, 3, 5\}$, $C = \{3, 4\}$ and $D = \{1, 3, 5\}$, check if $(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$ is true?
16. $f(x) = 2x + 3$, $g(x) = 1-2x$, $h(x) = 3x$. Prove that $f \circ (g \circ h) = (f \circ g) \circ h$.
17. Use Euclid's Division Algorithm to find the HCF of 396, 504, 636.
18. The sum of three consecutive terms that are in A.P. is 27 and their product is 288. Find the three terms.
19. In a G.P. the 9th term is 32805 and 6th term is 1215. Find the 12th term.
20. Rekha has 15 square colour papers of sizes 10cm, 11cm, 12cm, 24cm. How much area can be decorated with these colour papers?

21. If the function f is defined by $f(x) = \begin{cases} x+2 & \text{if } x > 1 \\ 2, & \text{if } -1 \leq x \leq 1 \\ x-1 & \text{if } -3 < x < -1 \end{cases}$ find the values of
i) $f(3)$ ii) $f(0)$ iii) $f(-1.5)$ iv) $f(2) + f(-2)$

PART - IV **$1 \times 8 = 8$**

22. Construct a triangle similar to a given triangle PQR with its sides equal to $\frac{3}{5}$ of the corresponding sides of the triangle PQR (scale factor $\frac{3}{5} < 1$)

கிரு. திவாரி புதுவை அக்கடமி - 2022
குறிப்பிடப் பகுதி 108, வகுப்பு [கல்லூரி]

காலை - அங்கு

I

குறிப்பான வினாக்கள்

1) $b_2 = ?$

2) $a_3 = ?$

3) $c_1 f(xy) \leq f(x) f(y)$

4) $d_1 = ?$

5) $e_3 = ?$

6) $b_3 = ?$

7) $d_3 = ?$

காலை - அங்கு

8) $y = x + 3$

$x = 0 \Rightarrow y = 0 + 3 = 3$

$x = 1 \Rightarrow y = 1 + 3 = 4$

$x = 2 \Rightarrow y = 2 + 3 = 5$

$x = 3 \Rightarrow y = 3 + 3 = 6$

$x = 4 \Rightarrow y = 4 + 3 = 7$

$x = 5 \Rightarrow y = 5 + 3 = 8$

மதிப்புக்கால் = {0, 1, 2, 3, 4, 5}

வித்திக்கால் = {3, 4, 5, 6, 7, 8}

ஏதேனும் = 4 - 8

9) $f(x) = \sqrt{2x^2 - 5x + 3}$

$f_2(x) = 2x^2 - 5x + 3$ $f_1(x) = \sqrt{x}$

$f(x) = \sqrt{2x^2 - 5x + 3} = \sqrt{f_2(x)}$

$= f_1[f_2(x)] = f_1 f_2(x)$

10) மாறியீடு காரணம்:

கூற்று $f: A \rightarrow B$ என்று நெற்றோடு கூற்று என்று கூறு

நிர்ணயித்து விடும் ஒரு பொருள் கூற்று என்று நெற்றோடு கூறும் அளவு

$f(x) = c$, ($x \in A$) நெற்றோடு கூறும் ஒரு தீவியான $c \in B$

$$\text{Q13) } ab^a \times b^a = 800$$

$$2^5 \times 5^2 = 800 \quad \therefore a=2, b=5$$

$$5^2 \times 2^5 = 800 \quad a=5, b=2$$

2	800
2	400
2	200
2	100
2	50
5	25
	5

(2) 16, 11, 6, 1 ... A.P

$$a=16, d=t_2-t_1=11-16=-5$$

$$l=-54$$

$$\therefore n = \frac{l-a}{d} + 1$$

$$n = \frac{-54-16}{-5} + 1 \Rightarrow 14+1$$

$$\therefore n=15$$

(3) 16 + 8 + 4 ... G.P

$$a=16, r=\frac{8}{16}=\frac{1}{2}$$

$$S_{\infty} = \frac{a}{1-r} = \frac{16}{1-\frac{1}{2}}$$

$$S_{\infty} = \frac{16}{2-\frac{1}{2}} = \frac{16 \times 2}{3} \therefore S_{\infty} = 32$$

(4) $5x \equiv 4 \pmod{6}$

$$5x-4 = 6n$$

$$5x = 6n+4$$

$$x = \frac{6n+4}{5}$$

$$n=1 \quad x = \frac{6 \times 1 + 4}{5} = \frac{10}{5} = 2$$

$$n=2 \quad x = \frac{6 \times 2 + 4}{5} = \frac{16}{5} = 8$$

$$\therefore n=1, 6, 11 \dots \text{or} \quad x=2, 8, 14 \dots$$

ANSWER - 8

15) $A = \{1, 2, 3\} \quad B = \{2, 3, 5\} \quad C = \{3, 4\} \quad D = \{1, 3, 5\}$

$$A \cap C = \{3\} \quad B \cap D = \{3, 5\}$$

$$(A \cap C) \times (B \cap D) = \{3\} \times \{3, 5\} = \{(3, 3), (3, 5)\} \text{ - Q}$$

$$A \times B = \{1, 2, 3\} \times \{2, 3, 5\}$$

$$A \times B = \{(1, 2), (1, 3), (1, 5), (2, 2), (2, 3), (2, 5), (3, 2), (3, 3), (3, 5)\}$$

$$C \times D = \{3, 4\} \times \{1, 3, 5\}$$

$$C \times D = \{(3, 1), (3, 3), (3, 5), (4, 1), (4, 3), (4, 5)\}$$

$$(A \times B) \cap (C \times D) = \{(3, 3), (3, 5)\} \rightarrow \textcircled{2}$$

$$\textcircled{1} = \textcircled{2}$$

$$(A \cap C) \times (B \cap D) = (A \times B) \cap (C \times D)$$

$$(b) f(x) = 2x + 3 \quad g(x) = 1 - 2x \quad h(x) = 3x$$

$$g \circ h = g(h(x)) = g(3x) = 1 - 6x$$

$$f \cdot (g \cdot h) = f((g \cdot h)x) = f[1 - 6x] = 2[1 - 6x] + 3$$

$$f \cdot (g \cdot h) = 2 - 12x + 3 = -12x + 5$$

$$f \cdot (g \cdot h) = 5 - 12x \rightarrow \textcircled{1}$$

$$f \cdot g = f(g(x)) = f[1 - 2x] = 2[1 - 2x] + 3$$

$$f \cdot g = 2 - 4x + 3 = -4x + 5$$

$$(f \cdot g) \cdot h = (f \cdot g)[h(x)] = (f \cdot g)[3x] = -12x + 5$$

$$(f \cdot g) \cdot h = 5 - 12x \rightarrow \textcircled{2}$$

$$\textcircled{1} = \textcircled{2}$$

$$f \cdot (g \cdot h) = (f \cdot g) \cdot h$$

$$(c) a = 396 \quad b = 504 \quad : a = bq + r$$

$$504 = 396 \times 1 + 108 \quad 108 \neq 0$$

$$396 = 108 \times 3 + 72 \quad 72 \neq 0$$

$$108 = 36 \times 3 + 0 \quad 36 \neq 0$$

$$72 = 36 \times 2 + 0 \quad : 396 \nmid 504 \quad \text{GCD}(a, b) = 36$$

$$208 + 72 + 36 = 280 \text{ M.T}$$

$$a = 636 \quad b = 36$$

$$636 = 36 \times 17 + 24$$

$$36 = 24 \times 1 + 12$$

$$24 = 12 \times 2 + 0$$

$$\therefore 396, 504 \& 636 \text{ are } \text{H.C.F.} = 12$$

18) A-P.W.E அடிக்கடி வரை 28848 ம் a-d, a, a+d

$$a-d+a+a+d=27$$

$$\therefore 3a=27 \quad a=9$$

$$(a-d) \times a \times (a+d) = 288 \quad (a^2 - d^2) a = 288$$

$$81 - d^2 = 32 \quad \therefore d^2 = 49$$

$$\therefore d = \pm 7$$

$$a=9, \quad d=7$$

$$a=9, \quad d=-7$$

$$\therefore 16, 9, 2$$

$$\therefore 16, 9, 2$$

$$19) t_9 = 32805$$

$$t_6 = 1215$$

$$t_n = ar^{n-1}$$

$$t_6 = ar^5 = 1215$$

$$t_9 = ar^8 = 32805$$

$$r^3 = 27 \quad \therefore r=3$$

$$\frac{t_9}{t_6} = \frac{ar^8}{ar^5} = \frac{32805}{1215}$$

$$a \times 243 = 1215 \quad \therefore a = \frac{1215}{243} = \frac{5}{9} = 5$$

$$ar^5 = 1215$$

$$\therefore a=5, \quad r=3, \quad n=12$$

$$\therefore t_{12} = 5(3)$$

$$20) 10^2 + 11^2 + \dots + 24^2 = (1^2 + 2^2 + \dots + 24^2) - (1^2 + 2^2 + \dots + 9^2)$$

$$\frac{n(n+1)(2n+1)}{6}$$

$$n=9$$

$$\frac{a(a+1)(2a+1)}{6}$$

$$a = 10(24)(2 \times 24 + 1)$$

$$= 10 \times 24 \times 49$$

$$= \frac{10 \times 24 \times 49}{6} = \frac{a \times 10 \times 19}{6}$$

$$= 4900 - 285 = 4615$$

21

 $f(3)$

$$f(x) = x+2$$

$$f(3) = 3+2 = 5$$

$$f(3) = 5$$

 $f(0)$

$$f(x) = x$$

$$f(0) = 0$$

$$f(0) = 0$$

 $f(-1.5)$

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

$$\therefore f(-1.5) = -1.5 - 1 = -2.5$$

$$f(-1.5) = -1.5 - 1 = -2.5$$

 $f(2)$

$$f(x) = x+2$$

$$f(2) = 2+2 = 4$$

$$f(2) = 4$$

 $f(-2)$

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

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

$$f(-2) = -3$$

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

Ques 21 - Q. 2

22

