XI - Mathematics

Supply (Target Paper 2019)

SECTION 'B'

(Complex No.; Algebra of Matrices)

(1) Simplify $\frac{(2+i)^2}{3-4i}$ OR Show that $\frac{1+2i}{3-4i}+\frac{2}{5}=\frac{i-2}{5i}$

OR

Solve the complex eqn;

$(x+3i)^2 = 2yi$

OR

$(x+2yi)^2 = xi$

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OR

If $z_1 = 1+i$; $z_2 = 3-2i$ then

evaluate; $|5z_1 - 4z_2|$

(2) Determine the value of 'K' for which the roots of the following equation are equal;

$x^2 - 2(1+3K)x + 7(3+2K) = 0$

OR

For what values of 'a' and 'b' will both roots of the equation

$x^2 + (2a-4)x = 3b+5$ vanish.

OR

Prove that the roots of the given eqn are equal; $x^2 - 2x\left(m + \frac{1}{m}\right) + 3 = 0$ $\forall\, m \in \mathbb{R}$.

OR

Find the value of 'K' by Synthetic division method if $(x+3)$ is a factor of $P(x) = 3x^3 + Kx^2 - 3x + 9$

(3) Solve; $x^4 + x^3 - 4x^2 + x + 1 = 0$

OR

$x^2 + y^2 = 169$;
$x - y = 13$

OR

$$\sqrt{\frac{1-x}{x}} + \sqrt{\frac{x}{1-x}} = \frac{13}{6}$$

OR

$$(x+6)(x+1)(x+3)(x-2) + 56 = 0$$

(7) Using properties of determinants; show that:

$$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$$

OR

$$\begin{vmatrix} a+x & a & a \\ a & a+x & a \\ a & a & a+x \end{vmatrix} = x^2(3a+x)$$

OR,

$$\begin{vmatrix} 1 & x & yz \\ 1 & y & zx \\ 1 & z & xy \end{vmatrix} = \begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix}$$

OR;

$$\begin{vmatrix} x+2y & x+6y & x+4y \\ x+3y & x+7y & x+5y \\ x+4y & x+8y & x+6y \end{vmatrix} = 0$$

Groups, Mathematical Induction, Binomial Theorem & Sequence:

(1) Let $*$ be defined in Z; the set of all integers; as $a * b = a + b + 3$. Show that;

a) $*$ is commutative and associative

b) Identity w.r.t $*$ exists in Z.

c) Every element of Z has an inverse w.r.t $*$.

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OR.

Using multiplication table; show that; multiplication $(\cdot)$ is a binary operation on $S = \{1, -1, i, -i\}$. Also show that $(\cdot)$ is commutative.

OR If $^{n}P_3 = 12 \, ^{\frac{n}{2}}P_3$; find n.

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OR

Let $S = \{1, w, w^2\}$; w being a complex cube root of unity. Construct a composition table w.r.t multiplication on $\mathbb{C}$ and show that:

(a) Associative law holds in 'S'

(b) 1 is identity element in 'S'

(c) Each element of 'S' has its inverse in 'S'.

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(2) Find the value of 'n' such that;

$$\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$$ may become A.M between 'a' and 'b'.

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OR

Which term of the geometric sequence;

27, 18, 12, ------ is $\frac{512}{719}$? Dr. Saad.

OR.

find the term independent of 'x' in the expression; $(1+2x)^{5/2}$.

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OR

Find the three no.s in A.P whose sum is 15 and product is 45.

OR.

If the sum of p terms of A.P is q and the sum of 'q' terms is p. find the sum (p+q)th term.

OR.

$3^{2n+2}-28n+4$ is divisible by 49.

OR.

A party of 6 to be choosen from a group of 5 ladies and 4 gents. How many ways can the party be formed?

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(3) If $Z = \frac{1+i}{1-i}$; then $z \cdot \bar{z} = z^2$

(4) find the cube roots of 729 or 27.

(5) Find the condition that one roots of $px^2 + qx + r = 0$ may be double the other.

(6) Verify $(A \cap B)' = A' \cup B'$ when; $A = \{1, 2\}$ $B = \{2, 3\}$ and $U = \{1, 2, 3, 4\}$. Dr. Saad.

(7) Show that the roots of the eqs are rational:

$$a^2bc\,x^2 + a(b^2+3c^2)x + b^2 - bc + 3c^2 = 0$$

(8) Solve for x;

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$$\begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 0 & -2 \\ 0 & 2 & 3 \\ -2 & 3 & 3 \end{bmatrix} \cdot \begin{bmatrix} x & 4 & -1 \end{bmatrix}^t = 0$$

(9) find 'K' if one root of $4y^2 - 7Ky + K + 4 = 0$ is zero.

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(10) Two cards are drawn randomly from a deck of well-shuffled cards. Find the probability that the cards drawn are:

(a) both aces (b) a King and a queen.

(11) Show that roots of $(x-a)(x-b) + (x-b)(x-c) + (x-c)(x-a) = 0$ are real and they can't be equal; $a = b = c$;

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Trigonometry

(1) A belt 24.75 m long passes through a 1.5 cm diameter pulley; As the belt makes two complete revolutions in a minute; how many radians does the wheel turn in one second.

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(2) How far does a boy on a bicycle travel in 10 revolutions; if the diameter of the wheel of his bicycle equals to 56 cm.

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(3) Prove that: $\tan^{-1}(x) - \tan^{-1}y = \tan^{-1}\left(\frac{x-y}{1-xy}\right)$.

or

$\tan^{-1}\frac{1}{3} + \frac{1}{2}\tan^{-1}\frac{1}{7} = \frac{\pi}{8}$ or $\sin^{-1}\theta = \cos^{-1}\sqrt{1-\theta^2}$

or

$\tan^{-1}\frac{1}{13} + \tan^{-1}\frac{1}{4} = \tan^{-1}\frac{1}{3}$. Dr. Saad.

(4) Solve the equation;

* $\sqrt{3}\cos\theta + \sin\theta - 2 = 0$ * $\sin x - \sqrt{3}\cos x = 1$
* $\cos\theta + \cos 2\theta + 1 = 0$ * $2\sin^2\theta - 3\sin\theta - 2 = 0$
* $\sqrt{1+\cos\theta} - \sqrt{1-\sin\theta} = 1$.

(5) Draw the graph of; $\sin(-\theta)$ or $\cos 2\theta$

(6) If $\cos\theta = \frac{3}{5}$ $p(\theta)$ in 3^{rd} quadrant; find remaining trigonometric functions.

(7) If $\sin\alpha = \frac{\sqrt{3}}{2}$; $\cos\beta = \frac{1}{\sqrt{2}}$; both $f(\alpha)$ and $f(\beta)$ are in 1^{st} quadrant; find the value of $\sin(\alpha+\beta)$.

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(8) Show that in a ΔABC;

$$\frac{1}{r^2} + \frac{1}{r_1^2} + \frac{1}{r_2^2} + \frac{1}{r_3^2} = \frac{a^2+b^2+c^2}{\Delta^2}.$$

(9) Prove that;

$$\Delta = r^2 \cot\frac{\alpha}{2} \cot\frac{\beta}{2} \cot\frac{\gamma}{2}.$$

or

$$r_1 r_2 r_3 = rs^2$$

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(10) The three sides of a triangular lot have length of 10, 11 & 13 cm respectively; Find the measures of its largest angle and the area of lot.

Section 'C'

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(1) If G_1, G_2, A are the means b/w b and c; prove that $G_1^3 + G_2^3 = 2Abc$

(2) If in a G.P $(j+k)$th term is x and $(j-k)$th term is y; prove that jth term is $\sqrt{xy}$.

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(3) In how many can the letters of word INTELLIGENCE or MATHEMATICS be arranged..

(4) If the sum of 8 terms of an AP is 64. and sum of 19 terms is 361. find the 9^{th} term of an A.P.

(5) The sum of infinite terms of a G.P is 4 and sum of their cubes is 192. Find the G.P.

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(6) If $\dfrac{1+3+5+\cdots+n\text{ terms}}{2+4+6+\cdots+n\text{ terms}} = 0.95$ find n;

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(7) If in a G.P the fifth term is 9th times the third term and its 2^{nd} term is 6. find the G.P.

(8) In how many ways 3 English, 2 Urdu and 3 sindhi books can be arranged on a book shelf so as to keep all the books in each language together?.

(9) Using mathematical induction to prove: that; $1+5+9+(4n-3) = n(2n-1)$ OR $1^2+2^2+3^2+\cdots+n^2 = \dfrac{n(n+1)(2n+1)}{n}$ by

Mathematical induction? $1^2+3^2+5^2+\cdots+(2n-1)^2=\frac{1}{3}n(2n-1)(2n+1)$

(10) Define a binary operation; $a*b=4ab$ show that $*$ is commutative & is associative.

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(11) Insert four harmonic means between 12 and $\frac{48}{5}$.

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(12) find the sum to 20 term of an A.P.; whose 4^{th} term is 7 and 7^{th} term is 13..

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(13) A rubber ball that is dropped on the floor from a height of 27m; always rebounds one-third of a distance of previous fall. find the distance it will have; travelled before hitting the ground for the 5^{th} time.

(14) Prove that a, b, c are in A.P, G.P and H.P. a/c as; $\frac{a-b}{b-c}=\frac{a}{a}$ or $\frac{a}{b}$ or $\frac{a}{c}$.

(15) The square of sum of three no.s in G.P is 361. and the sum of their squares is 133. find the no.s. or. If A, G & H are respectively geometric, arithmetic & harmonic mean

a & b; prove that $G^2 = AH$?

(16) If p^{th} term of an H.P is q; the q^{th} term is p; prove that the $(p+q)$th term is $\left(\frac{pq}{p+q}\right)$. Dr. Saad

(17) Show that,

$$\sqrt{3} = 1 + \frac{1}{3} + \frac{1.3}{3^2\, 2!} + \frac{1.3.5}{3^3 . 3!} + \cdots$$

(18) find the sum of first 100 integers which can be neither divisible by 5 nor 2

(19) The sum of four no.s in A.P is 4; and the sum of their squares is 24. Find the numbers. Dr. Saad

(20) If the equation; $(b-c)x^2 + (c-a)x + (a-b) = 0$ has equal roots; prove that a, b and c are in A.P.

(21) For what value of x do the no.s taken in order to form G.P; $1, x^2, 6-x^2$. Dr. Saad

(22) Express the value of $0.4\dot{2}\dot{3}$ as a common fraction.

(23) The probability that a man has a T.V is 0.6 and VCR is 0.2, TV & VCR both is 0.04; what is a probability of either TV or VCR.

(3) Simplify: $\frac{x(y-z)}{x-y}$ when; x, y, z are in;

* AP * G.P * H.P Dr. Saad.

(4) If; $a = b = c$ then prove that; $r_1 : R : r = 3 : 2 : 1$

(5) If "c" can be neglected so small. prove that;

$$\sqrt{\frac{l}{l+c}} + \sqrt{\frac{l}{l-c}} = 2 + \frac{3c^2}{l^2}$$

(6) Prove that;

* law of cosines or $r = \frac{\Delta}{s}$
* $r_2 = \frac{\Delta}{s-b}$ or $R = \frac{abc}{4\Delta}$

(7) If $y = \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots$ then prove that; $y^2 - 2y - 7 = 0$

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(8) Prove any two;

* $\cos^4\theta - \sin^4\theta = 1 - 2\sin^2\theta$
* $\cos 36^\circ = \frac{\sin 9^\circ - \cos 9^\circ}{\cos 9^\circ - \sin 9^\circ}$
* $\frac{\sin 3\theta}{\sin\theta} - \frac{\cos 3\theta}{\cos\theta} = 2$
* $\cot(\alpha - \beta) = \frac{\cot\alpha\cot\beta + 1}{\cot\alpha - \cot\beta}$
* $\tan\frac{\theta}{2} = \frac{1-\cos\theta}{\sin\theta}$
* $\frac{\sin 7\theta - \sin 5\theta}{\cos 7\theta + \cos 5\theta} = \tan\theta$

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9) Use Matrices Method;

$$x + y = 5$$
$$y + z = 7$$
$$z + x = 6$$

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or

$$\left.\begin{aligned} x + y - z &= 1 \\ x + 2y + z &= 7 \\ 3x - y + z &= 12 \end{aligned}\right\} \text{By cramer's rule}$$

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10) A piece of plastic strip 1m long; is bent to form an isosceles triangle, with 95° as its largest angle; find the length of sides.

11) If α, β are the roots of an equation $x^2 - 3x + 2 = 0$; form an equation whose roots are $(\alpha + \beta)^2$ and $(\alpha - \beta)^2$ Dr. Saad.

12) find the terms involving x^5 in the expansion $\left(x^2 - \frac{b}{x}\right)^n$; If the binomial coefficient of the 3rd terms & 6th terms are equals.

13) Find the area of triangle ABC, if $\alpha = 30^\circ$ $\beta = 63^\circ$ and $c = 7.3$ cm