

Roll No. 

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**MATHEMATICS**  
**SET - C**

**Time allowed : 3 hr**  
**General Instructions:**

**Maximum Marks : 100**

- (i) All Question are compulsory.
- (ii) The question paper consists of 29 questions divided into three sections A, B, and C. Section A comprises of 10 questions of **one mark** each. Section B comprises of 12 questions of **four marks** each and Section C comprises of **7** questions of **six marks** each.
- (iii) All questions in Section A are to be answered in one word, one sentence or as per the exact requirement of the question..
- (iv) There is no overall choice. However, internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.

**SECTION A**

- 1 The 4<sup>th</sup> term of a G.P. is x, the 10<sup>th</sup> term is y and the 16<sup>th</sup> term is z. Write the relation between x, y & z
- 2 Write the value of :  $\sin 78^\circ - \sin 18^\circ + \cos 132^\circ$
- 3 Express  $i^{17} + \left(\frac{1}{i}\right)^{24}$
- 4 Write the value of  $2\sin^2 \frac{\pi}{4} + 2\cos^2 \frac{3\pi}{4}$
- 5 Three coins are tossed once. Write the probability of getting at most one head.
- 6 Solve:  $\frac{3x-4}{2} \geq \frac{x+1}{4} - 1$
- 7 Write the equation of the straight line passing through the point (3,4) and has intercepts on the axes equal in magnitude but opposite in sign.
- 8 If  ${}^n P_5 = {}^n C_5 = x!$  find x
- 9 A ball is drawn at random from a box containing 6 blue, 8 black and 10 brown balls. write the probability that the ball drawn is not black.
- 10 If  $\tan 3x = \tan(n-3)x$ , then what is x ?

**SECTION B**

- 11 Find the modulus and argument of the complex number  $\frac{1+7i}{(2-i)^2}$

**OR**

Show that a real value of x will satisfy the equation  $\frac{1-ix}{1+ix} = a-ib$  if  $a^2 + b^2 = 1$  where a, b are real no.

- 12 Prove that using the principle of mathematical induction for all  $n \in \mathbb{N}$ ,  $x^{2n} - y^{2n}$  is divisible by  $x+y$ .
- 13 How many words, with or without meaning can be made from the letters of the word SUNDAY assuming no letter is repeated, if
  - (i) 4 letters are used at a time ?
  - (ii) all letter are used at a time ?
  - (iii) all letters are used but first letter is a vowel ?
- 14 How many 3 digit even number can be made using the digits 1,2,3,4,6,7 if no digit is repeated ?
- 15 Solve the equation :  $3 \tan x + \cot x = 5 \operatorname{Cosec} x$
- 16 Prove that  $\cos 12^\circ \cos 24^\circ \cos 48^\circ \cos 96^\circ = -\frac{1}{16}$
- 17 Find the equation of a line drawn perpendicular to the line  $\frac{x}{4} + \frac{y}{6} = 1$  through the point where it meets the y axis

**OR**

Find the equation of the circle passing through the points (1, 3), and (2, -1) and has its centre on the line  $2x+y-4=0$ .

- 18 A line is such that its segment between the lines  $5x-y+4=0$  and  $3x+4y-4=0$  is bisected at the point  $(1,5)$ . Obtain its equation.
- 19 Find the coordinates of the foci and the vertices, the eccentricity and the length of the latus rectum of the hyperbola:  $\frac{y^2}{9} - \frac{x^2}{27} = 1$

OR

- Find the equation of the ellipse whose axes along the coordinate axes, passing through  $(4,3)$  and  $(-1,4)$ .
- 20 i) Let R be the relation on the set N of natural number defined by:  
 $R = \{(a,b) : a + 3b = 12, a \in N, b \in N\}$ . Find (a) R (b) Domain of R (c) Range of R.
- 21 A point R with x-coordinate 4 lies on the line segment joining the points  $P(2,-3,4)$  and  $Q(8,0,10)$ . Find the coordinates of the point R.
- 22 Find the probability that when a hand of 7 cards is drawn from a well-shuffled deck of 52 cards, it contains at least 3 kings.

OR

Out of 100 students, two sections of 40 and 60 are formed. If you and your friend are among the 100 students, what is the probability that  
 (a) you both enter the same section? (b) you both enter the different sections?

### SECTION – C

- 23 There are 200 individuals with a skin disorder, 120 had been exposed to the chemical  $C_1$ , 50 to chemical  $C_2$  and 30 to both the chemicals  $C_1$  and  $C_2$ . Find the number of individuals exposed to  
 (i) Chemical  $C_1$  but not chemical to  $C_2$  (ii) Chemical  $C_2$  but not chemical to  $C_1$   
 (iii) Chemical  $C_1$  or chemical  $C_2$ .
- 24 Solve the system of inequality graphically:  $4x + 3y \leq 60, y \geq 2x, x \geq 3, x, y \geq 0$ .
- 25 (i) If  $a, b, c, d$  are in G.P. prove that  $(a^n + b^n), (b^n + c^n), (c^n + d^n)$  are G.P.  
 (ii) If  $p$ th,  $q$ th,  $r$ th and  $s$ th terms of an A.P. are in G.P., then show that  $(p-q), (q-r), (r-s)$  are also in G.P.

OR

- (i) If  $a, b, c, d$  are in G.P., show that  $(a^2 + b^2 + c^2)(b^2 + c^2 + a^2) = (ab + bc + ad)^2$   
 (ii) If  $S_1, S_2$  and  $S_3$  are the sum of  $n$  natural numbers, their squares, and their cubes respectively, show that:  $9S_2^2 = S_3(1 + 8S_1)$ .
- 26 The first three terms in the binomial expansion of  $(x + y)^n$  are 1, 56 and 1372 respectively, find  $x, y$  and  $n$

OR

- (i) Find the term independent of  $x$  in the expansion of  $\left(\frac{3}{5}x^2 - \frac{1}{2x}\right)^9$   
 (ii) Find the coefficient of  $x^7$  in the expansion of  $(1 - x^4)(1 + x)^9$ .
- 27 (i) Evaluate  $\lim_{x \rightarrow 2} \frac{x^3 - 6x^2 + 11x - 6}{x^2 - 6x + 8}$ .  
 (ii) Find the derivative of  $\frac{x^n - a^n}{x - a}$  for some constant  $a$ .
- 28 Calculate the mean variance and standard deviation for the following distribution:

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

- 29 (i) Prove that  $\cos^3 x \cos^3(120^\circ + x) + \cos^3(240^\circ + x) = \frac{3}{4} \cos 3x$   
 (ii) Prove that:  $\frac{\sin(A - C) + 2 \sin A + \sin(A + C)}{\sin(B - C) + 2 \sin B + \sin(B + C)} = \frac{\sin A}{\sin B}$

Best of Luck