(17)

XI-D

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FIRST TERM EXAMINATION (2017-18)
CLASS - XI
MATHS

M.M. : 100 TIME : 3 Hrs.

GENERAL INSTRUCTIONS :

1. This question paper has 4 pages
2. All questions are compulsory.
3. Section A has Q. 1-4 which carries 1 mark each.
   Section B has Q. 5-12 which carries 2 marks each.
   Section C has Q. 13-23 which carries 4 marks each.
   Section D has Q. 24-29 which carries 6 marks each.
4. Use of calculator is not allowed.

SECTION A

Q1 Find the value of $8\cos^3\frac{\Pi}{9}-6\cos\frac{\Pi}{9}$

Q2 If 'n' is any integer, then find the value of $(1-i)^n\left(1-\frac{1}{i}\right)^n$

Q3 Find $(n+1)^{th}$ term from the end in the expansion of $\left(x-\frac{1}{x}\right)^{3n}$

Q4 If $A = 1 + r^a + r^{2a} + \ldots\ldots\ldots\ldots + \infty$ and
$B = 1 + r^b + r^{2b} + \ldots\ldots\ldots\ldots + \infty$ then find $r^a \cdot r^b$

SECTION B

Q5 Find real 'θ' such that $\frac{3+2i\sin\theta}{1-2i\sin\theta}$ is purely real.

Q6 If a, b, c are in A.P. ; b, c, d are in G.P. and $\frac{1}{c}, \frac{1}{d}, \frac{1}{e}$ are in A.P. prove that a, c, e are in G.P.

Q7 Find the sum of 'n' terms of series : $\frac{1}{1x2}+\frac{1}{2x3}+\frac{1}{3x4}+\ldots\ldots\ldots\ldots$

Q8 If x^P occurs in the expansion of $\left(x^2+\frac{1}{x}\right)^{2n}$

Prove that its coefficient is $\frac{(2n)!}{\left(\frac{4n-P}{3}\right)!\left(\frac{2n+P}{3}\right)!}$

Q9 In any Δ ABC, prove that :
a sin (B-C) + b sin (C-A) + c sin (A-B) = 0

Q10 Solve the following system of inequalities :
$|x-1| \leq 5$, $|x| \geq 2$

Q11 Find the $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ if $\sin x = \frac{1}{4}$, where x lies in second quadrant.

Q12 In how many ways 5 boys and 3 girls be seated in a row so that no two girls are together ?

SECTION C

Q13 By using principle of Mathematical Induction, prove that $2.7^n + 3.5^n - 5$ is divisible by 24 for all $n \in N$.

Q14 Solve the system of linear inequalities graphically :
$x + 2y \geq 0$, $2x + y \leq 4$, $x > 0$, $y < 2$

Q15 If the A.M. and G.M. between two numbers are in the ratio m : n, then prove that the numbers are in the ratio $m+\sqrt{m^2-n^2} : m-\sqrt{m^2-n^2}$

Q16 Convert the following complex number into polar form :

$$\frac{i-1}{\cos\frac{\Pi}{3}+i\sin\frac{\Pi}{3}}$$

Q17 In any Δ ABC, prove that :
$(b^2-c^2)\cot A + (c^2-a^2)\cot B + (a^2-b^2)\cot C = 0$

Q18 If α and β are different complex number with $|\beta|=1$, then find $\left|\frac{\beta-\alpha}{1-\overline{\alpha}\beta}\right|$

Q19 Solve the following equations :

$4 \sin x \cos x + 2 \sin x + 2 \cos x + 1 = 0$

OR

$\sin x \tan x - 1 = \tan x - \sin x$

Q20 How many words with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word 'HONESTY' ?

Write the importance of HONESTY in our life.

Q21 Find the coefficient of x^4 in the expansion of the product $(1 + 2x)^4 (2 - x)^5$

OR

Find the value of 'K' so that the term independent of 'x' in the expansion of $\left(\sqrt{x} - \frac{K}{x^2}\right)^{10}$ is 405.

Q22 If the coefficients of three consecutive terms in the expansion of $(1+x)^n$ are in the ratio 1 : 7 : 42, find n.

Q23 The difference between any two consecutive interior angles of a polygen is 5°. If the smallest angle is 120°, find the number of sides of polygon..

OR

If 'a', 'b' are the roots of $x^2 - 3x + p = 0$ and c, d are the roots of $x^2 - 12x + q = 0$. Where a, b, c, d form a G.P., prove that :

$(q + p) : (q - p) = 17 : 15$

SECTION D

Q24 If a_1 , a_2 , a_3 and a_4 are coefficients of any four consecutive terms in the expansion of $(1+x)^n$, prove that : $\frac{a_1}{a_2 + a_1} + \frac{a_3}{a_3 + a_4} = \frac{2a_2}{a_2 + a_3}$

Q25 Prove that :

$\sin 10° \sin 30° \sin 50° \sin 70° = \frac{1}{16}$

OR

a) Prove that : 4

$$\cos^2 x + \cos^2\left(x+\frac{\Pi}{3}\right) + \cos^2\left(x-\frac{\Pi}{3}\right) = \frac{3}{2}$$

b) Prove that : $\frac{\sec 8x - 1}{\sec 4x - 1} = \frac{\tan 8x}{\tan 2x}$ 2

Q26 a) Find the sum to 'n' term of series : 4

$5 + 7 + 13 + 31 + 85 + \ldots\ldots\ldots\ldots$

b) If a, b, c are in G.P. and $a^{1/x} = b^{1/y} = c^{1/z}$ then prove that x, y z are in A.P. 2

Q27 a) Find the square root of 1-i 4

b) If $x - iy = \sqrt{\frac{a-ib}{c-id}}$ then prove that : $(x^2+y^2)^2 = \frac{a^2+b^2}{c^2+d^2}$ 2

Q28 In how many ways can the letters of the word 'PERMUTATIONS' be arranged such that :

a) P comes before S.
b) Word start with P and end with S.
c) All vowels are together
d) P comes before S and there are always 4 letters between P and S.

Q29 a) A solution of 8% boric acid is to be diluted by adding a 2% boric acid solution to it. The resulting mixture is to be more than 4%, but less than 6% boric acid. If we have 640 litres of 8% solution, how many litres of 2% solution will have to be added ? 4

b) An electrician can be paid under two schemes as given below : 2
Scheme I : ₹ 500 and ₹ 70 per hour.
Scheme II : ₹ 120 per hour.
If the job takes 'x' hours, for what value of 'x' does the scheme I give the electrician better wages ?