KRISHNAGAR ACADEMY

HALF-YEARLY (PHASE - II) EXAM' 2020-2021

CLASS – XI SUB. – MATHS F.M. – 60

Attempt all the questions from the Group-A and either Group-B or Group-C

GROUP-A (50 Marks)

Q.1 a) Find the term independent of x in the expansion of
$$\left(3x - \frac{1}{2x^2}\right)^9$$
. [7×2]

b) Prove that $\tan\left(\frac{\pi}{3} + x\right) \tan\left(\frac{\pi}{3} - x\right) = \frac{2\cos 2x + 1}{2\cos 2x - 1}$

c) If $\cos(\theta + \phi) = m\cos(\theta - \phi)$, then prove that $\tan \theta = \frac{1-m}{1+m} \cot \phi$.

d) If
$$x + iy = \left(\frac{1+i}{1-i}\right)^3 - \left(\frac{1-i}{1+i}\right)^3$$
, then find (x, y) .

e) If the sum of the certain number of terms of the A.P. 25,22,19, is 116, find the last term.

f) The first term of a G.P. is 729 and 7th term is 64. Find the sum of first 7 terms of the G.P. g) If the lines 2x + y - 3 = 0 and 5x + ky - 3 = 0 and 3x - y - 2 = 0 are concurrent, find the value of k.

Q.2 Prove by the principle of induction that : $x^{2n-1} - y^{2n-1}$ is divisible by x-y, $n \in N[4]$ **Q.3** If $\tan(\theta + \phi) = m \tan(\theta - \phi)$, then prove that $\sin 2\theta = \frac{m+1}{m-1} \sin 2\phi$ [4] **Q.4** If $x \cos \theta = y \cos\left(\theta + \frac{2\pi}{3}\right) = z \cos\left(\theta + \frac{4\pi}{3}\right)$, then find the value of xy + yz + zx. [4] OR

If angle θ is divided into two parts such that the tangent of one part is k times the tangent of the other, and φ is their difference, then show that $\sin \theta = \frac{k+1}{k-1} \sin \varphi$ **Q.5** If $(x + iy)^{\frac{1}{3}} = a + ib$, where x, y, a, $b \in R$, show that $\frac{x}{a} - \frac{y}{b} = -2(a^2 + b^2)$. [4]

Q.6 In an A.P., if pthterm is $\frac{1}{q}$ and qth term is $\frac{1}{p}$, prove that the sum of first pq terms is $\frac{1}{2}(pq + 1)$. [4]

<u>Q.7</u>Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ be the geometric mean between a and b. [4]

OR

How many words can be formed by using the letters of the word INDEPENDENCE in which

i) the words start with P ii) the words begin with I and end wih P.

Q.8 Using Principle Mathematical Induction, prove that[6]

$$1 + \frac{1}{1+2} + \frac{1}{1+2+3} + \dots + \frac{1}{1+2+3+\dots+n} = \frac{2n}{n+1}.$$

Q. **9**Prove that the coefficient of x^n in the expansion of $(1 + x)^{2n}$ is twice the coefficient of x^n in the expansion of $(1 + x)^{2n-1}$. [6]

OR

Show that the middle term of the expansion of $\left(x - \frac{1}{x}\right)^{2n}$ is $\frac{1 \cdot 3 \cdot 5 \cdot \cdots \cdot (2n-1)}{n!} (-2)^n$. The following frequency distribution:

GROUP - B

Attempt all questions

Q. 10 Find the coordinates of a point on the parabola $y^2 = 8x$ whosefocaldistancess 4.

OR

Prove that the equation of the chord joining the points (x_1, y_1) and (x_2, y_2) lying on the Parabola $y^2 = 4ax$ is $(y - y_1)(y - y_2) = y^2 - 4ax$. [4]

Q. 11 If I and I' be the lengths of segments PS and P'S of a focal chord PP' of a parabola

$$y^2 = 4ax$$
, then show that $\frac{1}{l} + \frac{1}{l'} = \frac{1}{a}$. [6]

GROUP-C

Attempt all questions

Q.12 Calculate the median of the following frequency distribution:

Class limits :	130)-134	135-139	140-144	145-149	150-154	155-159	160-164	
Frequency :		5	15	28	24	17	10	1	[4]
OR									
Find the 7 th decile 59 th percentile from the following frequency distribution:									
Marks	: (0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of students	s :	20	32	40	46	38	30	28	16
Q.13 The following is a frequency distribution:									
Marks	: 30	-40	40-50	50-60	60-70	70-80	80-90	90-10	00
No. of students	s: .	3	4	13	24	40	30	6	5
Find Mean, Median and Standard Deviation.									