Simran Singh

XI-B

MODERN CONVENT SCHOOL
Sector – 4, Dwarka

I TERM EXAM (2017-18)

Class: XI
Subject: Mathematics (041)

Set 2

Time: **3 Hours**
M.M.: **100 Marks**

General Instructions

1. *All questions are compulsory*
2. *Question No. 1 to 4 carry ONE MARK each*
3. *Question No. 5 to 12 carry TWO MARKS each*
4. *Question No. 13 to 23 carry FOUR MARKS each.*
5. *Question No.24 to 29 carry SIX MARKS each.*

SECTION –A

Q 1 If R_1 { (x , y): y = 2x + 7, where x $\in$ R , and -5 $\leq$ x $\leq$ 5 }, then find the domain and range of R

Q 2 Solve the Quadratic equation $2x^2 - \sqrt{3} x + 1 = 0$

Q 3 Find the values of x, which satisfy the equality and graph the solution set on the number line

$$-\frac{1}{5} \leq \frac{3x}{10} + 1 < \frac{2}{5} \ , x \in R$$

Q 4 Find the number of terms in the following expansion of
$(x + a)^{41}$ - $(x - a)^{41}$ after simplification

SECTION –B

Q 5 In a beauty contest half the number of judges voted for miss A, 2/3 of the voters for miss B, 10 voted for both and 6 did not vote for either miss A or miss B
Find how many judges in all were present there

$$\frac{1}{2} + \frac{2}{3} + 10 + 6$$

Q 6 Find the domain of the function f defined by $f(x) = \sqrt{4-x} + \dfrac{1}{\sqrt{x^2-1}}$

Q 7 Draw the graph of the function (by plotting four points) and find the domain and range of it : $f(x) = x^3$

Q 8 If tan x = 2 tan y, Prove that $\dfrac{\sin(x+y)}{\sin(x-y)} = 3$

Q 9 Find all non zero complex numbers z satisfying $\bar{z} = iz^2$

Q 10 In how many ways 4 different balls be distributed in 5 boxes so that all the balls are not put in the same box.

Q11. How many odd numbers less than 1000 can be formed using the digits 0, 4, 5, 7 if the repetition of the digits not allowed?

Q 12 Find the ratio of the co efficient of x^{15} to the term independent of x in the expansion of

$\left(x^2 + \dfrac{2}{x}\right)^{15}$

SECTION – C 4M

4M

Q 13 Using P M I prove that $11^{n+2} + 12^{2n+1}$ is divisible by 133 for every $n \in N$

Q 14 Using P M I prove that for all $n \in N$,

$3 \cdot 2^2 + 3^2 \cdot 2^3 + 3^3 \cdot 2^4 + 3^4 \cdot 2^5 \ldots \quad 3^n \cdot 2^{n+1} = \dfrac{12}{5}(6^n - 1)$

Q15a) Find the real values of x and y if $\dfrac{(1+i)x-2i}{3+i} + \dfrac{(2-3i)y+i}{3-i} = i$

b) If $\left(\dfrac{1-i}{1+i}\right)^{500} = a+ib$, find a and b

Q16. Solve graphically and say if the solution area is bounded or not? Is (2,-1) a solution for the system or not?

X+y<5, 4x+y ≥ 4, x+5y≥ 5, x≤ 4, y ≤ 3

Q17. Solve for x in the form of real interval

a) $\dfrac{2x-1}{3} \geq \dfrac{3x-2}{4} - \dfrac{2-x}{5}$

b) Find all pairs of consecutive odd positive integers both of which are larger than 5, such that their sum is less than 23.

Q18. Prove the following:

i) $nP_r = (n-1)P_r + r \cdot (n-1)P_{r-1}$

ii) $nC_r + nC_{r-1} = n+1 \, C_r$

OR

Out of 5 men and 6 women, a committee of 5 persons is to be formed so as to include

i)   at least 1 woman then how many ways can it be done?

ii)   Atmost two men

(iii)   Should women be given equal right?

(iv)   Write two other values are to be promoted.

Q19a) Find the co-efficient of $x^9 y^{-3}$ in the expansion of

$$\left(\frac{2X^2}{Y} + \frac{Y}{3X}\right)^{12}$$

b) Write the fourth term from the beginning and from the end of the above expansion

OR

(i) If the co-efficient of 5th, 6th, 7th terms in the expansion of $(1+x)^n$ are in AP, then the find the values of n.

(ii) Find the values of 98^5 and $(10.1)^4$ using binomial theorem

Q.20 If U={x/x $\in N, x \leq 30$}, A={x/x is prime < 15}

B={x/x is a perfect square≤ 10} and C={x/x is a perfect cube ≤ 30} then verify the following results

i) (AUB)' = A' $\cap$ B '   ii) (A$\cap$B)' = A ' U B '

iii) (A$\cap$ B) $\cap$ C = A $\cap$ (B$\cap$C)   iv) A '$-$B '= B $-$ A

Q 21 a) Solve the following for x if [ ] is the greatest integer function:-

i) [1 $-$ 2x] = -3

ii) $[x]^2 - 5 [x] + 6 = 0$

b) Define the greatest integer function with graph , write the domain and range

Q 22. Find the angle in radians between the hands of the clock at 7:20 PM

Q23. Prove that sin x + sin 3x+ sin 5x+ sin 7x= 4 cos x cos 2x sin 4x

OR

Find the general solution:-

$3\cos^2 x - 2\sqrt{3} \sin x \cos x - 3\sin^2 x = 0$

SECTION D   6M

6M

Q 24 a) Represent the complex number in the standard form :

$\sqrt{2} \left[\cos \left(-\frac{\pi}{4} \right) + I \sin \left(-\frac{\pi}{4} \right) \right]$

b) Find the conjugate of complex number $(-\sqrt{3} + \sqrt{-2})(2\sqrt{3} - i)$

c) Find the modulus and amplitude of the complex number $\frac{2+6\sqrt{3}\,i}{5+\sqrt{3}i}$.

Q 25 How many numbers between 99 and 1000 can be formed such that

20

i) every digit is either 3 or 7

ii) no digit is repeated

iii) the digit in hundred's place is 7

iv) the digit 7 does not appear in any place

v) at least one of the digit is 7

vi) the number is neither 3 nor 7 *with*

OR

Q How many arrangements can be formed by the letter of the word VOWELS if

i) there is no restriction

ii) if each word begins with S

iii) each word begins with S and ends with E

iv) all vowels come together

v) 'O' is always in the 2nd place

vi) all consonants come together

Q 26 a) Find the term independent of x in the expansion of $\left(2x - \frac{x^2}{4} \right)^9$

b) Find the 7th term in the expansion of $\left(2x^3 - \frac{3}{2x} \right)^{10}$

c) Prove that the middle term of the expansion of $(1 + x)^{2n}$ is $\frac{1.3.5 \dots (2n-1)}{n!} 2^n x^n$

Membrane
biogenesis

Q27 a) Prove that n(A – B) = n (A) – n (A ∩ B) = n (A U B) – n (B) if A and B are such that

A = { x / x is the letter in the word JAIPUR}

B = { y/ y is the letter in the f word JODHPUR}

b) In an examination 80% students passed in MATHEMATICS, 72 % passed in SCIENCE and 13% failed in both the subjects. If 312 students passed in both the subjects, find the total number of students who appeared in the examination.

Q28) Let A = { 1,2 } , B = { 1, 2, 3, 4 } , C = { 5 , 6 } D = { 5 , 6 , 7 , 8 }

i) How many relations are possible from A to C

ii) Write n (P(A x D))

iii) Write all the subsets of D

iv) Verify AXC is the subset of BXD or not

v) Verify (A – B) X C = (A X C) – (B X C)

vi) Find (AXB) ∩ (AX C)

OR

Let R be a relation on N × N defined by
   (a, b) R (c, d) ⇔ a + d = b + c for all (a, b), (c,d) ∈ N × N Show that:
(i) (a, b) R (a, b) for all (a,b) ∈ N × N
(ii) (a, b) R (c, d) ⇒ (c,d) R (a, b) for all (a,b), (c,d) ∈ N × N
(iii) (a, b) R (c, d) and (c, d) R (e, f) ⇒ (a, b) R (e, f) for all (a, b), (c, d), (e, f) ∈ N × N

Q 29 a) Find the $\cos \frac{x}{2}$ and $\tan \frac{x}{2}$ if $\sin x = \frac{1}{4}$, x does not lie in first quadrant.
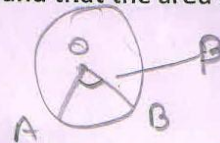
b) In any triangle prove that

$\tan \frac{A-B}{2}$ = $\frac{a-b}{a+b}$ $\cot \frac{c}{2}$

OR

A sector of a circle of radius is bounded by an arc AB and by two radii OA and OB, at an angle β radians. Given that the perimeter of the sector is 18 m and that the area of the sector is 8 m², calculate the numerical values of r and β