Directorate of Education, GNCT of Delhi

PRACTICE PAPER (MID TERM)

(2022-23)

Class – XI
Mathematics (Code: 041)

Time: 3 hours **Maximum Marks: 80**

General Instructions :

1. This Question paper contains - **five sections A,B,C,D,E**. Each section is compulsory. However, there are internal choices in some questions.
2. **Section A** has 18 **MCQ's and 02** Assertion-Reason based questions of 1 mark each.(20 Marks)
3. **Section B** has 5 **Very Short Answer (VSA)-type** questions of 2 marks each.(10 Marks)
4. **Section C** has 6 **Short Answer (SA)-type** questions of 3 marks each.(18 Marks)
5. **Section D** has 4 **Long Answer (LA)-type** questions of 5 marks each.(20 Marks)
6. **Section E has 3 Source based/Case based/passage based/integrated units of assessment (4 marks each) with sub parts.(12 Marks)**

Section – A

Question Number 1-18 are of MCQ type question one mark each.

Q. No.		Marks
1.	Let two finite sets have m & n elements . The number of subsets of the first set is 112 more than that of second set. The values of m and n are respectively : (a) 4 , 7 (b) 7 , 4 (c) 4 , 4 (d) 7 , 7	1
2	If $X=\{8^n-7n-1 \mid n\in N\}$ and $Y=\{49n-49 \mid n\in N\}$ then (a) $X\subset Y$ (b) $Y\subset X$ (c) $X=Y$ (d) $X\cap Y=\phi$	1

3 **1**

Let S= {x | x is a positive multiple of 3 less than 100}

P={x | x is a prime number less than 20}.
Then n(S)+n(P) is :

(a) 34	(b) 41
(c) 33	(d) 30

4 **1**

Let R be the set of points inside a rectangle of sides a and b (a,b>1)with two sides along the positive direction of x- axis and y-axis. Then

(a) $R=\{(x,y):0\le x\le a,0\le y\le b\}$	(b $R=\{(x,y):0\le x<a,0\le y\le b\}$
(c) $R=\{(x,y):0\le x\le a,0<y<b\}$	(d) $R=\{(x,y):0<x<a,0<y<b\}$

5 **1**

Let n(A)=m and n(B)=n then number of non empty relations that can be defined from A to B is :

(a) m^n	(b) n^m-1
(c) $mn-1$	(d) $2^{mn}-1$

6 **1**

Let F_1 be a set of parallelograms F_2 the set of rectangles , F_3 set of rhombuses , F_4 set of squares and F_5 the set of trapeziums in a plane . Then F_1 may be equal to :

(a) $F_2\cap F_3$	(b) $F_3\cap F_4$
(c) $F_2\cup F_5$	(d) $F_2\cup F_3\cup F_4\cup F_1$

7 **1**

Domain of $\sqrt{a^2-x^2}$ (a>0) is :

(a) (-a,a)	(b) [-a,a]
(c) [0,a]	(d) (-a,0]

8 If $f(x)=\frac{9}{5}x+32$, the value of f(-10) is : **1**

(a) 15	(b) 14
(c) -15	(d) -14

9 If A and B are finite sets such that n(A)=5 and n(B)=7, then the number of functions from A to B: **1**

(a) 7^5	(b) 5^7
(c) 7^7	(d) 5^5

10 The value of $i+i^{10}+i^{20}+i^{30}$ is: **1**

(a) 1	(b) $-i$
(c) 0	(d) $i-1$

11 If z is a complex number , then **1**

(a) $\|z^2\|>\|z\|^2$	(b) $\|z^2\|=\|z\|^2$
(c) $\|z^2\|<\|z\|^2$	(d) $\|z^2\|\geq\|z\|^2$

12 If $f(z)=\frac{7-z}{1-z^2}$, where $z=1+2i$, then $|f(z)|$ is : 1

(a) $\frac{\|z\|}{2}$	(b) $\|z\|$
(c) $2\|z\|$	(d) None of these

13 The solution of equation $x^2+6xi-9=0$ is : 1

(a) $x=\pm 3i$	(b) $x=-3i,-3i$
(c) $x=-i,i$	(d) None of these

14 1

If $\tan\theta=\frac{1}{2}$ and $\tan\phi=\frac{1}{3}$ then $\theta+\phi$ equals to :

(a) $\frac{\pi}{6}$	(b) π
(c) 0	(d) $\frac{\pi}{4}$

15 1

The maximum value of sinx.cosx is :

(a) 1	(b) 2
(c) $\sqrt{2}$	(d) $\frac{1}{2}$

16 1

If for all values of x , $\cos\theta=x+\frac{1}{x}$ then

(a) θ is an acute angle	(b) θ is right angle
(c) θ is obtuse angle	(d) No value of θ is possible

17 1

The value of $\cos^2 48^0-\sin^2 12^0$ is :

(a) $\sqrt{5}+\frac{1}{8}$	(b) $\sqrt{5}-\frac{1}{8}$
(c) $\sqrt{5}+\frac{1}{5}$	(d) $\sqrt{5}+\frac{\frac{1}{2}}{\sqrt{2}}$

18 1

If f(x) = p(x)+q, where p and q are integers ,

f(-1) = 5, and f(3) = 3 then p and q are equal to :

(a) p=-3, q=-1	(b) p=2, q=-3
(c) p=0, q=-2	(d) p=2, q=3

	(ASSERTION-REASONING BASED QUESTIONS) **In the following questions, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct answer out of the following choices.** **(a) Both A and R are true and R is the correct explanation of A.** **(b) Both A and R are true but R is not the correct explanation of A.** **(c) A is true but R is false.** **(d) A is false but R is true.**	
19	Given A= {a,b,c} ,B={a ,e ,i ,o ,u } and C={x, y ,z} **Assertion (A) :** $(A\cup B)\cap C=\phi$ **Reason (R) :** $(A\cup B)=\{a,b,c\}\cup\{a,e,i,ou\}$ = $\{a,b,c,e,i,o,u\}$ $(A\cup B)\cap C=\{a,b,c,e,i,o,u\}\cap\{x,yz\}=\phi$	1
20	**Assertion (A) :**Domain of f(x) = x|x| is R **Reason (R) :**Domain of f(x) = x|x| is N	1
	Section B **This Section contains 5 Very Short Answer (VSA)-type questions of 2 marks each.**	
21	**If** $A=\{1,2,3,4,5\}$ $B=\{1,3,5,8\}$ $C=\{2,5,7,8\}$ verify that $A-(B\cup C)=(A-B)\cap(A-C)$ **OR** If $A=\{x:x\in N\}$ $B=\{x:x=2n,n\in N\}$ $C=\{x:x=2n-1,n\in N\}$ $D=\{x:is\,a\,prime\,natural\,number\}$ Find (a) $(A\cap B)$ (b) $(B\cap C)$	2
22	Determine the domain and range of relation R , Where $R=(x,x^3):x\,is\,prime\,number\,less\,than\,10$ **OR** Function $f:R\rightarrow R$ is defined by $f(x)=x^2$ Determine (a) Range of f (b) $\{x:f(x)=4\}$	2
23	Prove that $\tan(60^0+\theta)$. $\tan(60^0-\theta)$ = $\frac{2\cos(2\theta+1)}{2\cos(2\theta-1)}$	2
24	Prove that sin(n+1) x. sin (n+2) x + cos(n+1) x. cos (n+2)x = cos x	2
25	Find n if $(n+2)!=2550\times n!$ **OR** How many 3-digit even numbers can be made using the digits 1,2,3,4,5,6, if no digit is repeated.	2

	Section C **This section contains Six Short Answer (SA)-type questions of 3 marks each.**	
26	If A= {3,6 ,12 ,15, 18,21}, B={4,8,12,16,20} C={2,4,6,8,10,12,14,16} and D={5,10,15,20} Find (a)A-B (b)B-C (c) B-D	3
27	Let $A=\{1,2,3,4,5,\ldots\ldots\ldots 20\}$. Define a relation R from A to A by $R=\{(a,b):a-2b=0,a,b\in A\}$ Depict the relation using roaster form . Write domain and range of the relation.	3
28	If $\cot x=\frac{5}{12}$, x lies in the second quadrant. Find the values of other five trigonometric functions **OR** Show that $(\frac{1+\sin\theta}{1-\sin\theta})$ = $\tan(\frac{\pi}{4}+\frac{\theta}{2})$	3
29	If $a+ib=\frac{x^2+1}{2x^2+1}$ prove that $a^2+b^2=\frac{(x^2+1)^2}{(2x^2+1)^2}$ **OR** If $z_1=3+i$ and $z_2=1+4i$ verify that $\lvert z_1-z_2\rvert\geq\lvert z_2\rvert-\lvert z_1\rvert$	3
30	Solve the following system of inequality graphically: $2x+y\geq 6$, $3x+4y\leq 12$ **OR** IQ of a person is given by the formula , $IQ=\frac{MA}{CA}\times 100$ where MA is the mental age and CA is Chronological age . If $80\leq IQ\leq 140$ for a group of 12 year old children, find the range of their mental age.	3
31	In how many ways 7 positive and 5 negative signs can be arranged in a row so that no two negative signs occur together?	3
	SECTION D **This section contains four Long Answer (LA)-type questions of 5 marks each.**	
32	Find domain and range of real function $f(x)=\sqrt{x^2-16}$ **OR** Let $f=\{[x,\frac{x^2}{1+x^2}]:x\in R\}$ be function from R to R . Determine range of f.	5
33	Prove that $\sin^4\frac{\pi}{8}+\sin^4\frac{3\pi}{8}+\sin^4\frac{5\pi}{8}+\sin^4\frac{7\pi}{8}=32$ **OR** If $\frac{\cos(A-B)}{\cos(A+B)}$ + $\frac{\cos(C+D)}{\cos(C-D)}$ =0 , then prove that tan A . tan B . tan C . tan D =-1	5
34	Three balls are drawn from a bag containing 5 red , 4 white , and 3 black balls .Find the number of ways in which this can be done if atleast 2 balls are red .	5
35	Solve the inequality $3x+2y\geq -6$ graphically.	5

SECTION E

Source based/Case based/passage based/integrated units of assessment Questions

36 Myiesha is a class XI th student of a reputed school . She had been anxiously waiting for having a get together with her classmates as she could not be with them for a stretch of year due to Covid 19 and Board Exam of class X th. She invited four of her best friends Koyal ,Ayushi ,Prisha ,and Sanchi to her birthday party on 26th March. After cutting cake , her elder sister Khushali wants to take group photograph of all of them standing in a single row. 4

Based on the information given above answer any four questions

(i) How many distinct photographs can be clicked?

(a) 120	(b) 240
(c) 60	(d) 30

(ii) In how many photographs Myiesha will be standing in the middle?

(a) 12	(b) 24
(c) 36	(d) 60

(iii) In how many of these photographs Myiesha and Sanchi will be standing next to each other?

(a) 120	(b) 24
(c) 48	(d) 60

(iv) In how many photographs Myiesha and Ayushi will not be standing together?

(a) 48	(b) 96
(c) 120	(d) 72

(v) In how many photograph Prisha would not be in the middle?

(a) 24	(b) 48
(c) 96	(d) 120

37	Two friends Rahul and Nihal were discussing 'Set' based problems . Nihal asked one question from Rahul .If A={x:x is a set of letters need to spell 'CATARACT' and B={x:x is a set of letters need to spell 'TRACT'. Based on information given above answer any four questions asked by Nihal	4

(I) Which of the following is true?

(a) A=B	(b) $A \subset B$
(c) $B \subset A$	(d)None of these

(ii) $A \cup B$ equals to:

(a) None of these	(b) B
(c) $A \cap B$	(d) ϕ

(iii) $A \cap B$ equals to:

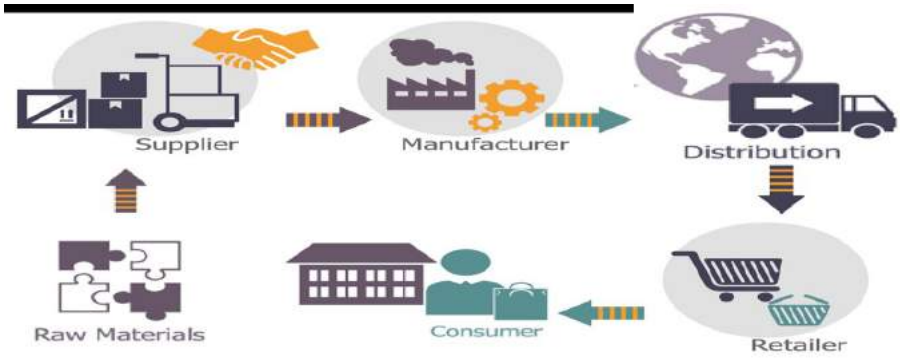
(a) A	(b) None of these
(c) $A \cup B$	(d) ϕ

(Iv) B-A equals to :

(a) A	(b) B
(c) ϕ	(d) None of these

(v) No of proper subset of B are

(a) 13	(b 14
(c) 15	(d 16

38	A company produces certain items : Manager in the company used to make a data record on daily basis about the cost and revenue of those items separately . The cost and revenue function of the product are given by .C(x)=20X+4000 and R(x) =60x +2000 respectively where X is the number of Items produced and sold . The company manager has few questions in mind , help him to solve them.  (i) How many items must be sold to realize some profit? (ii) If the cost and revenue functions of the product are given by C(X)=2x+400 ,R(X)=6x+20 respectively , Where X is the number of items produced by the manufacturer. Calculate the Minimum number of items that the manufacturer must sell to realize some profit .	2+2 =4