KENDRIYA VIDYALAYA SANGATHAN, RAIPUR REGION

SESSION ENDING EXAM (2024-25)

CLASS-XI **SUBJECT- MATHEMATICS (041)**

M.M.: 80 **TIME: 3 Hours**

General Instructions:

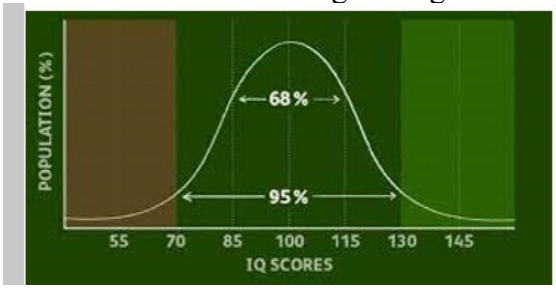
* 15 Minutes extra time has been allotted to read this question paper.

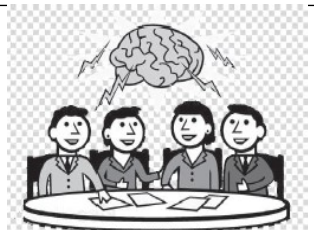
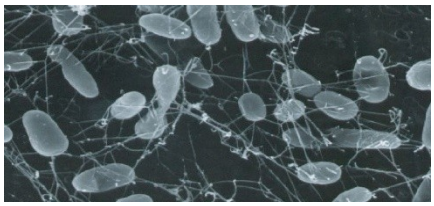
1. This Question paper contains - five sections A, B, C, D and E. Each section is compulsory. However, there are internal choices in some questions.
2. Section A has 18 MCQ's and 02 Assertion-Reason based questions of 1 mark each.
3. Section B has 5 Very Short Answer (VSA)-type questions of 2 marks each.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

Q.No.	Question	Marks
	Section – A (1 Mark Questions)	
Question no. 1 to 18 are multiple choice questions. Choose the correct choices.		
1	The set A = $\left\{x : x \text{ is a natural number}, -\frac{5}{2} < x < \frac{7}{2}\right\}$ in tabular form is (a) {-2,-1,0,1,2,3} (b) {-1,0,1,2,3} (c) {0,1,2,3} (d) {1,2,3}	1
2	If A = {1,7} and B = {2,3,4,7, 8}, then A∩ B is (a) {2,7} (b) {7} (c) {2,3,4} (d) {3,4}	1
3	The domain of $f(x)=\frac{1}{\sqrt{x+3}}$ is (a) $(-\infty,3)$ (b) $(-3,\infty$¿ (c) $(0,-3)$ (d) $(-3,0$¿	1
4	If $(4x+3,y)=(3x+5,-2)$, then the sum of the values of x and y is (a) 0 (b) 2 (c) –2 (d) 1	1
5	The Range of $f(x)=\sqrt{a^2-x^2}$(a> 0)is (a) [0 , a] (b) (-a, o) (c) (- a , a) (d) [-a , a]	1
6	The value of $\sin\frac{31\pi}{3}$ is (a) $\frac{-1}{2}$ (b) $\frac{1}{2}$ (c) $\frac{\sqrt{3}}{2}$ (d) $\frac{-\sqrt{3}}{2}$	1
7	The multiplicative inverse of (4 – 3i) is (a) $\frac{4-3i}{25}$ (b)$\frac{4+3i}{25}$ (c) $\frac{4+3i}{5}$(d) $4+3i$	1
8	The number of different four digit numbers that can be formed with the digits 2, 3, 4, 7 and using each digit only once is (a) 120 (b) 96 (c) 24 (d) 100	1

9	If $\frac{1}{4!}+\frac{1}{6!}=\frac{x}{7!}$, then the value of x is (a) 217 (b) 121 (c) 64 (d) none of these	1
10	No. of terms in the expansion of $\left(x^2+\frac{3}{x}\right)^7$ is (a) 6 (b) 4 (c) 5 (d) 8	1
11	The value of $\sum_{r=1}^{n} 3^r.{}^nC_r$ is (a) 5^n (b) 5^n-1 (c) 4^n (d) 4^n-1	1
12	If the fifth term of a G.P is 2, then the product of its first 9 terms is (a) 64 (b) 256 (c) 512 (d) 1024	1
13	The inclination of line $\sqrt{3}x+3y=5$ with positive $x-$¿ axis is (a) 180^0 (b) 60^0 (c) 30^0 (d) 150^0	1
14	The coordinates of the Centre of the circle $x^2+y^2-8x+10y-12=0$ are (a) (0,4) (b) (4, 5) (c) (4 ,- 5) (d) (- 4 , 5)	1
15	The equation of parabola whose focus is (3 , 0) and directrix $x=-3$ is (a) $y^2=12x$ (b) $y^2=-12x$ (c) $x^2=12y$ (d) $x^2=-12y$	1
16	Derivative of Sec x with respect to x is (a) Sec x (b) Sec x tan x (c) tan x (d) Sec^2 x	1
17	The value of $\lim_{x\to 0}\frac{e^{2x}-1}{x}$ is (a) -2 (b) 2 (c) 0 (d) $\frac{1}{2}$	1
18	The mean deviation about the median for the data 3, 9, 5 , 3, 12 ,10 ,18 , 4, 7 ,19 ,21 is (a) 5.27 (b) 6.67 (c) 6.27 (d) 7.67	1
	ASSERTION-REASON TYPE QUESTIONS The following questions (Q. No. 19 & 20) contain two statements: Assertion (A) and Reason (R). Each question has four alternative choices, only one of which is the correct statement. Choose the correct choice. (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	**Assertion(A):** If $\tan\theta=\frac{1}{2}$ and $\tan\varnothing=\frac{1}{3}$,then $\theta+\varnothing=\frac{\pi}{4}$ **Reason(R):** $\tan(\alpha+\beta)=\frac{\tan\alpha+\tan\beta}{1-\tan\alpha\tan\beta}$	1
20	**Assertion(A):** $\lim_{x\to\frac{\pi}{2}}\frac{1-sinx}{cosx}=1$	1

	Reason(R): $\lim_{x \to 0} \frac{sinx}{x} = 1$	
	Section – B (2 Marks Questions)	
21	If U $=\{1,2,3,4,5,6,7,8\}$, A $=\{1,3,5\}$ and B $=\{2,3,5,8\}$ then find (i) $(A \cup B) - ¿ (A \cap B)$ (ii) $A' \cap B'$	2
22	Find the sum of the sequence 7, 77, 777, 7777,……..to n terms. **OR** Find the value of n so that $\frac{a^{n+1}+b^{n+1}}{a^n+b^n}$ may be geometric mean between a and b.	2
23	Find the equation of the hyperbola where foci are $(0, \pm 12¿$ and the length of the latus rectum is 36.	2
24	Find the point on Y- axis which is at a distance $\sqrt{10}$ from the point (1,2,3).	2
25	In a group of 10 outstanding students in a school, there are 6 boys and 4 girls, 3 students are to be selected out of these at random for a debate competition. Find the probability that one is boy and two are girls. **OR** If the letters of the word ALGORITHM are arranged at random in a row what is the probability that the letters G, O, R must remain together?	2
	Section – C (3 Marks Questions)	
26	Let A and B be two sets. If $A \cap X = B \cap X = \phi$ and $A \cup X = B \cup X$, for some set X, show that A = B. **OR** Using properties of sets prove that: $A - ¿(B \cap C) = (A - ¿B) \cup (A - ¿C)$	3
27	Draw the graph of $f(x) = \|x\|$ and find its domain and range.	3
28	Prove that: $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$	3
29	If $a+ib = \frac{(x+i)^2}{2x^2+1}$, then show that $a^2+b^2 = \frac{(x^2+1)^2}{(2x^2+1)^2}$ **OR** Find the real numbers x and y if $(x-iy)(3+5i)$ is the conjugate of $-6-24i$.	3
30	Find the number of arrangements of the letters of the word **PERMUTATIONS** so that (a) All vowels always occur together. (b) Words begin with P and end in S. **OR** How many words, with or without meaning, each of 2 vowels and 3 consonants can be formed from the letters of the word **DAUGHTER**.	3
31	Usi Using binomial theorem, find $(a+b)^4 - (a-b)^4$. Hence evaluate $(\sqrt{3}+\sqrt{2})^4 - (\sqrt{3}-\sqrt{2})^4$.	3
	Section – D (5 Marks Questions)	
32	(i) Prove that $\cos 6x =$. (ii) Prove that: $\tan 3x \tan 2x \tan x = \tan 3x - \tan 2x - \tan x$. **OR**	3 2 OR

	If $\tan x = \frac{-4}{3}$, x lies in second quadrant, find $\sin\frac{x}{2}$, $\cos\frac{x}{2}$ and $\tan\frac{x}{2}$.	5
33	Prove that the product of the lengths of the perpendiculars drawn from the points ($\sqrt{a^2-b^2}$, 0) and ($-\sqrt{a^2-b^2}$, 0) to the line $\frac{x}{a}\cos\theta+\frac{y}{b}\sin\theta = 1$ is b^2.	5
34	(i) Find the derivative of $f(x)=\tan x$ from first principle. (ii) Find the derivative of $\frac{x+\cos x}{\tan x}$.	3 2
35	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 **OR** The mean and standard deviation of 20 observations are found to be 10 and 2 respectively. On rechecking, it was found that an observation 8 was incorrect. Calculate the correct mean and standard deviation if wrong item is omitted.	5
	Section – E (4 Marks Questions) **Case-Study/Passage-Based Questions**	
36	IQ of a person is calculated by the formula IQ = $\frac{M}{C}$ x 100, where M is the mental age and C is the chronological age of a person. Answer the following questions. 	
	(i) If IQ of a person of Mental age 30 years is 60, find the chronological age of the person.	1
	(ii) A person's Chronological age is 50 years, to have IQ at least70, what minimum mental age he should have in completed years.	1
	(iii) Mental age of a person is 30 years. To have IQ between 50 and 60, what should be his chronological age? **OR** If Chronological age of a person is 40 years. To have IQ between 30 and 40, what should be his Mental age?	2
37	A management committee of a residential colony decided to award two members which will be selected from two men and two women for their contribution to keep the colony clean.	

		
	(i) Find the probability that the committee will select at most 1 man	2
	(ii) Find the probability that the committee will select both from the same gender.	2
38	The number of bacteria in a culture doubles every hour. There were 50 bacteria present in the culture originally.  Based on the above information, answer the following questions:	
	(i) How many bacteria will be present at the end of 2^{nd} hour?	1
	(ii) How many bacteria will be present at the beginning of the 5^{th} hour?	1
	iii) How many bacteria will be present at the end of $(n-1)^{th}$ hour? **OR** Find the ratio of numbers of bacteria present at the end of n^{th} hour to the beginning of $(n+3)^{th}$ hour.	2