KENDRIYA VIDYALAYA SANGATHAN AGRA REGION
FIRST PRE BOARD EXAMINATION 2024-25

CLASS XII TIME: 03 HOURS

SUBJECT: MATHEMATICS MAX. MARKS: 80

General Instructions:

Read the following instructions very carefully and strictly follow them:

(i) This Question paper contains **38** questions. **All** questions are **compulsory**.

(ii) This Question paper is divided into **five** Sections - **A, B, C, D** and **E**.

(iii) In **Section A**, Questions no. **1** to **18** are **multiple choice questions (MCQs)** and Questions no. **19** and **20** are **Assertion-Reason based** questions of **1 mark each.**

(iv) In **Section B**, Questions no. **21** to **25** are **Very Short Answer (VSA)-type** questions, carrying **2 marks each.**

(v) In **Section C**, Questions no. **26** to **31** are **Short Answer (SA)-type** questions, carrying **3 marks each.**

(vi) In **Section D**, Questions no. **32** to **35** are **Long Answer (LA)-type** questions, carrying **5 marks each.**

(vii) In **Section E**, Questions no. **36** to **38** are **Case study-based questions**, carrying **4 marks each.**

(viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 3 questions in Section C, 2 questions in Section D and one subpart each in 2 questions of Section E.

(ix) Use of calculators is **not** allowed.

SECTION –A

[This section comprises of Multiple Choice Questions (MCQ) 1 mark of each]

Q1	If $f(x)=\begin{cases} \frac{x^3-a^3}{x-a} & ,x\neq a \\ b & ,x=b \end{cases}$ is continuous at x =a,then b is equal to (a)a^2 (b) $2a^2$ (c) $3a^2$ (d) 4 a^2	1
Q2	If y = $Ae^{5x} + Be^{-5x}$, then d^2y/dx^2 = (a)25y (b)5y (c)-25y (d)15y	1
Q3	The lines $\frac{x-2}{1}=\frac{y-3}{1}=\frac{4-z}{k}$ and $\frac{x-1}{k}=\frac{y-4}{2}=\frac{z-5}{-2}$ are mutually perpendicular if the value of k is :	

	(a) $\frac{-2}{3}$ (b)$\frac{2}{3}$ (c) -2(d) 2	1
Q4	If A is a square matrix of order 3 and $\|A\|$=6, then the value of $\|Adj\ A\|$is : (a) 6 (b) 36 (c) 27 (d) 216	1
Q5	If A =$\begin{bmatrix} 0 & a & 5 \\ -2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$is a skew symmetric matrix, then a+b+c= (a)3 (b) 0 (c) -3 (d) None of these	1
Q6	The lines $\vec{r} = 0\hat{i} + 0\hat{j} + 0\hat{k} + \lambda(\hat{i} + 2\hat{j} + 3\hat{k})$ and $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \mu(-2\hat{i} - 4\hat{j} - 6\hat{k})$; (where λ & μ are scalars) are: (a) intersecting (b) parallel (c) skew (d) coincident	1
Q7	The value of 'n' , such that $x^n\frac{dy}{dx} = y^2(\log y - \log x + 1)$;(where x,y are positive real numbers) is homogeneous: (a)0 (b) 1 (c)2 (d) 3	1
Q8	If A and B are two events such that P(A/B)=2P(B/A) and P(A) + P(B) = 2/3 , then P(B)= (a)2/9 (b)7/9 (c)4/9 (d)5/9	1
Q9	If A=$\begin{bmatrix} x & 1 \\ -1 & -x \end{bmatrix}$, such that A^2 =O,then x = (a) 0 (b) +_ 1 (c) 1 (d) -1	1
Q10	If $\vec{a}$is a unit vector and ($\vec{x} - \vec{a}$)·($\vec{x} + \vec{a}$) = 15 then $\|\vec{x}\|$ is (a) ± 4 (b) 4 (c) - 4 (d) $\pm\sqrt{7}$	1
Q11	A linear programming Problem is as follows: Minimise Z=2x+y Subject to constraints x≥3,x≤9,y≥0 x-y≥0,x+y≤14 The feasible region has : (a)5 corner points including (0,0) and (9,5) (b)5 corner points including (7,7) and (3,3) (c)5 corner points including (14,0) and (9,0) (d)5 corner points including (3,6) and (9,5)	1

Q12	The sum of the order and degree of differential equation $\frac{d}{dx}[(\frac{dy}{dx})^3]=0$ is: (a)2 (b)3 (c)5 (d)0	1
Q13	The value of λ for which the vectors $3\hat{\imath} - 6\hat{\jmath} + \hat{k}$ and $2\hat{\imath} - 4\hat{\jmath} + \lambda\hat{k}$ are parallel is: (a)2/3 (b)3/2 (c)5/2 (d)2/5	1
Q14	If A is a given square matrix. Then A+ A' is a: (a)scalar matrix (b) diagonal matrix (c) symmetric matrix (d) null matrix	1
Q15	If f(x) = $\int_0^x tsint\, dt$, then f '(x) is: (a) cosx + sinx (b) xsinx (c) xcosx (d) sinx + xcosx	1
Q16	If $\left\|\vec{a} \mathrm{X} \vec{b}\right\| = \sqrt{3}$ and $\vec{a} \cdot \vec{b}$ = -3 , then angle between $\vec{a}$ and $\vec{b}$ is: (a)$2\pi/3$ (b) $\pi/6$ (c) $\pi/3$ (d) $5\pi/6$	1
Q17	The area of a triangle with vertices (-3,0),(3,0) and (0,k) is9 square units. The value of k is: (a) 9 (b)3 (c) -9 (d) 6	1
Q18	The graph of the inequality 2x+3y>6 is : (a)Half plain that contains the origin. (b)Half plane that neither contains the origin nor the points of the line 2x+3y=6. (c)Whole XOY- plane excluding the points on the line 2x+3y=6. (d)Entire XOY-plane.	1

ASSERTION-REASON BASED QUESTIONS

Directions: In the question no. (19) and (20) , 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 and (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false. (d) (A) is false but (R) is true.		
Q19	Assertion (A): f(x)=tanx-x always increases Reason (R): Any function y=f(x) is increasing if $\frac{dy}{dx}>0$	1
Q20	ASSERTION (A): The function $f: R \to\ R$ defined by $f(x) = [x]\ is\ neither\ one - one\ nor\ \ onto.$ REASON (R): The function $f: R \to R$ defined f(x) =|x| is onto.	1
SECTION –B [This section comprises of Very Short Answer (VSA)-type questions of 2 marks each]		
Q21	The cost (in rupees) of 'x' items is given by C(x)= $0.000014x^3 + 0.005x^2 + 5x + 1100$ Find the marginal cost of 200 items. OR Find the maximum and minimum values if any of the function given by f(x)=sin2x+5 .	2
Q22	The volume of a sphere is increasing at the rate of 8 cm^3/s. Find the rate at which its surface area is increasing when the radius of sphere is 12 cm.	2
Q23	Evaluate :$\int_1^2 \frac{1}{x(logx)^4}$ dx	2
Q24	Show that the function f given by f(x) = $x^3 - 3x^2 + 3x+107$, x ∈ R is increasing on R.	2
Q25	Find the principal value of $\sin^{-1}\left[\cos\left(\sin^{-1}\frac{1}{2}\right)\right]$ OR Find the domain of $cos^{-1}(2x-3)$	2
SECTION –C [This section comprises of Short Answer (SA)-type questions of 3 marks each]		
Q26	Evaluate :$\int \frac{dx}{5-4x-2x^2} dx$	3

	OR Evaluate: $\int_0^{\frac{\pi}{4}} log(1 + tanx)\ dx$	
Q27	If y = $(sin^{-1}x)^2$ show that (1 – x^2)$\frac{d^2y}{dx^2}$ – x $\frac{dy}{dx}$ -2 = 0.	3
Q28	Find :$\int \frac{x^2}{(x^2+4)(x^2+9)}\ dx$	3
Q29	Two numbers are selected at random(without replacemet) from positive integers 2, 3, 4, 5, 6 and 7. Let X denote the larger of the two numbers obtained. Find the probability distribution of X.	3
Q30	Solve the differential equation: (Cos^2x)$\frac{dy}{dx}$ + y = tan$x$;$\left(0 \leq x < \frac{\pi}{2}\right)$ OR Solve the differential equation: $(1 + e^{2x})$dy + (1+y^2) e^xdx = 0	3
Q31	Solve the following Linear Programming Problem graphically: Minimize Z = 3x + 9y subject to the constraints: x + 3y ≤ 60, x + y ≥ 10, y - x≥ 0, x ≥ 0, y ≥ 0 OR Solve the following Linear Programming Problem graphically: MaximizeZ = 400x +300y subject to the constraints: x + y ≤ 200 ,x ≤ 40, x ≥ 20, y ≥ 0	3
	SECTION – D [This section comprises of Long Answer (LA)-type questions of 5 marks each]	
Q32	Find the area of the region bounded by the line 3x-y+2=0, the x axis and the ordinates x= -1 and x =1.	5
Q33	If A ={x∈Z : 0≤x≤15}. Show that R= {(a,b): a,b∈A ,$\lvert a - b\rvert$is divisible by 5} is an equivalence relation. Find the set of all elements related to 1. OR	5

	Let N denote the set of all natural numbers and R be the relation on N×N defined by (a,b)R(c,d) if ad(b+c)=bc(a+d). Show that R is an equivalence relation.	
Q34	Evaluate the product AB, where $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$, Hence solve the system of linear equations: x – y = 3 , 2x + 3y + 4z =17 , y + 2z = 7	5
Q35	Show that the lines $\frac{x+1}{3}=\frac{y+3}{5}=\frac{z+5}{7}$ and $\frac{x-2}{1}=\frac{y-4}{3}=\frac{z-6}{5}$ intersect. Also find their point of intersection. OR Find the shortest distance between the lines. $\frac{x-3}{1}=\frac{y-5}{-2}=\frac{z-7}{1}$ and $\frac{x+1}{7}=\frac{y+1}{-6}=\frac{z+1}{1}$	5
SECTION – E [This section comprises of 3 case-study/passage based questions of 4 marks each with sub parts]		
Q36	Read the following passage and answer the questions given below: Some students of class XIItends to stay up all night and therefore are not able to wake up on time in morning. Not only this but their dependence on tuitions further leads to absenteeism in school.Of the students in class XII,it is known that 30% of the students have 100% attendance.Previous year results report that 80% of all students who have 100% attendance attain A grade and 10% irregular students attain A grade in their annual examination.At the end of the year, one student is chosen at random from the class XII. **Using above information, answer the following.** **(i)**Find the conditional probability that a student attainsA grade given that he is not 100% regular student. **(ii)**Find the probability of attaining A grade by the students of class XII. **(iii)**Find the probability that student is 100% regular given that he attains A grade. OR	1 1 2

	(iii) Find the probability that student is irregular, given that he attains A grade.	
Q37	Read the following passage and answer the questions given below: A mam is watching an airplane which is at the coordinate point A(2,-3,3)assuming that the Man is at O(0,0,0).At the same time he saw a bird at the coordinate point B(1,0,2). Based on the above information answer the following questions (i) Find the position vector of vector $\overrightarrow{AB}$? (ii) Find the distance between airplane and bird? (iii) Find the direction cosines of $\overrightarrow{AB}$? OR (iii) what is the angles $\overrightarrow{AB}$ makes with x,y and z axes?	1 1 2
Q38	Read the following passage and answer the questions given below. In a park, an open tank is to be constructed using metal sheet with a square base and vertical sides so that it contains 500 m^3 of water. **Using above information, answer the following:** **(i)**Find the Minimum surface area of the tank. **(ii)**Find the percentage increase in volume of the tank, if size of square base of tank become twice and height remains same.	2 2

'END OF PAPER'