INDIAN SCHOOL AL WADI AL KABIR

Revision Paper_ Assessment - I

Class: XII Sub: MATHEMATICS (041) Max Marks: 80

Date: 01.09.2025 Time: 3 hr

General Instructions:

1. This question paper is divided in to 5 sections- A, B, C, D and E
2. Section A comprises of 20 MCQ type questions of 1 mark each.
3. Section B comprises of 5 Very Short Answer Type Questions of 2 marks each.
4. Section C comprises of 6 Short Answer Type Questions of 3 marks each.
5. Section D comprises of 4 Long Answer Type Questions of 5 marks each.
6. Section E comprises of 3 source based / case based / passage-based questions (4 marks each) with sub parts.
7. Internal choice has been provided for certain questions

SECTION – A

(Each MCQ Carries 1 Mark)

1 If $f'(x) = \sin^{-1}(\cos x)$, then $f(x)$ is

a) $\frac{\pi}{2}x - \frac{x^2}{2} + c$ b) $\frac{\pi}{2}x + \frac{x^2}{2} + c$ c) $\pi - \frac{x^2}{2} + c$ d) $\frac{1}{\sqrt{1-x^2}}$

2 The value of 'k' for which the function $f(x) = \begin{cases} \frac{k\cos x}{\pi - 2x}, & if\ x \neq \frac{\pi}{2} \\ 3, & if\ x = \frac{\pi}{2} \end{cases}$ is continuous at $x = \frac{\pi}{2}$ is

a) 0 b) 6 c) 1 d) 2

3 If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & -5 & 3 \\ 0 & 3 & 8 \end{bmatrix}$ is :

a) a scalar matrix b) a skew symmetric matrix c) *an identity matrix* d) a symmetric matrix

4 The value of $\int \frac{1-cosx}{1+cosx}\,dx$ is

a) tanx +c b) $2tanx + c$ c) $2tan\frac{x}{2} + c$ d) $2tan\frac{x}{2} - x + c$

5 The value of $\sin^{-1}\left[\sin\left(\frac{3\pi}{5}\right)\right]$ is

a) $\frac{13\pi}{7}$ b) $-\frac{13\pi}{7}$ c) $\frac{2\pi}{5}$ d) $-\frac{\pi}{7}$

6 The total revenue in Rupees received from the sale of x units of a product is given by $R(x) = 5 + 36x + 3x^2$. The marginal revenue when x = 15 is.

a) ₹ 42 b) ₹ 72 c) ₹ 114 d) ₹ 126

7 $\int \frac{1}{(x-1)(x-2)}$ dx equals

a) $2\log|x-1| - \log|x-2| + C$ c) $-\log|x-1| - 2\log|x-2| + C$

b) $\log|x-1| - \log|x-2| + C$ d) $\log|x-2| - \log|x-1| + C$

8 The number of all possible matrices of order 3 x 3 with each entry 0 or 1 is

a) 512 b) 1 c) 81 d)27

9 $\text{Cosec}^2(\cot^{-1}2) + \sec^2(\tan^{-1}3) = ?$

a) 13 b) 15 c) 5 d) 1

10 Let A be a non-singular matrix of order 3 x 3. Then $|adj\ A|$ is equal to

a) $|A|$ b) $|A|^2$ c) $|A|^3$ d) $3|A|$

11 If y = a cos mx + b sin mx, then $\frac{d^2y}{dx^2}$ is

a) m^2y b) $-m^2y$ c) my d) - my

12 Value of $\int \frac{\cos\sqrt{x}}{\sqrt{x}}$ dx is

a) $-2\sin\sqrt{x} + c$ b) $\sin\sqrt{x} + c$ c) $2\cos\sqrt{x} + c$ d) $2\sin\sqrt{x} + c$

13 For the function $f(x) = |x| + |x-1|$, then, which of the following is correct?

a) f(x) is is both continuous and differentiable at x= 0 and x=1

b) f(x) is continuous but not differentiable at x= 0 and x=1

c) f(x) is neither continuous nor differentiable at x= 0 and x=1

d) f(x) is not continuous but differentiable at x= 0 and x=1

14 The rate of change of area of a circle with respect to its radius 'r' at r = 6cm is

a) 10π cm b) 12π cm c) 8π cm d) 11π cm

15 Find x if $\begin{vmatrix} 3 & -6 \\ 4 & 0 \end{vmatrix} = \begin{vmatrix} 3 & x^2 \\ x & -1 \end{vmatrix}$

a) 4 b) √-6 c) -3 d)3

16 What are the critical points of the function $f(x) = x(x-1)^2$, $0 \le x \le 2$?

a) 2, 8 b) $\frac{1}{2}, \frac{1}{4}$ c) 1, $\frac{1}{3}$ d) $\frac{1}{3}$, 0

17 If f(x) = log x, then f '(x) + f '$\left(\frac{1}{x}\right)$ is

a) $\frac{x^2-1}{x}$ b) $\frac{1-x^2}{x}$ c) $\frac{x^2+1}{x}$ d) $\frac{1+x}{x}$

18 If y = log $\sqrt{\tan x}$, then the value of $\frac{dy}{dx}$ at x = $\frac{\pi}{4}$

a) ∞ b) 1 c) $\frac{1}{2}$ d) 0

Directions: In the following 2 questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.
(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 and R is True

19 **Assertion (A):** If A is a square matrix such that $A^2 = A$, then $(I + A)^2 - 3A = A$
Reason (R): A square matrix has an inverse if and only if it is non-singular

20 **Assertion (A):** The relation f: {1, 2, 3, 4} → {x, y, z, p} defined by
f = {(1, x), (2, y), (3, z), (4, p)} is a bijective function.
Reason (R): All injective functions are bijective.

SECTION – B

(Each Question Carries 2 Marks)

21 If A = $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & x \\ -2 & 2 & -1 \end{bmatrix}$ is a matrix satisfying AA' = 9I, find x

22 Evaluate $\int \frac{(x+1)(x+\log x)}{x} dx$

- OR -

Evaluate: $\int cos2x.cos4x dx$

23

a) Find the value of $\cos^{-1}[\cos(\pi)] + \sin^{-1}(\sin\frac{3\pi}{4}) + \tan^{-1}(1)$

- OR -

b) Find the domain of $\sin^{-1}(x^2 - 4)$

24 A function f where $f: N \rightarrow Z$ such that

$$f(x) = \begin{cases} \frac{n+1}{2}, if\ n\ is\ odd \\ -\frac{n}{2}, \ if\ n\ is\ even \end{cases}$$

Is the function injective? Justify your answer.

25 Find the value of 'a' and 'b' such that the function defined is a continuous function

$$f(x) = \begin{cases} 1, \ if\ x \leq 3 \\ ax + b, \ if\ 3 < x < 5 \\ 7, \ if\ x \geq 5 \end{cases}$$

SECTION – C

(Each Question Carries 3 Marks)

26 Find $\frac{dy}{dx}$ if $x = \frac{1+\log t}{t^2}$ and $y = \frac{3+2\log t}{t^2}$, $t > 0$

27 a) Evaluate: $\int \frac{2x}{(x^2+1)(x^2+4)}\,dx$

- OR

b) Evaluate: $\int \frac{2x+3}{(x^2+2x+2}\,dx$

28 a) The volume of a cube is increasing at a rate of 8 cubic centimetres per second. How fast is the surface area increasing when the length of an edge is 12 centimetres?

- OR -

b) A balloon, which always remains spherical, has a variable diameter $\frac{3}{2}(2x + 1)$. Find the rate of change of its volume with respect to x.

29 a) Let $f: R \rightarrow R$ be a function defined as $f(x) = \cos x$.
Show that the function $f(x)$ is neither one-one nor onto.

- OR -

b) Show that the function f: R to R defined as $f(x) = 5x+3$ is bijective.

30 Express the matrix $A = \begin{bmatrix} 1 & 3 & -5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and skew symmetric matrix.

31 If y = $\frac{\log x}{x}$, show that $\frac{d^2y}{dx^2} = \frac{2\log x - 3}{x^2}$

SECTION – D

(Each Question Carries 5 Marks)

32 a)Define the relation R in the set $N \times N$ as follows:
For (a, b), (c, d) ∈ $N \times N$, (a, b) R (c, d) iff ad = bc.
Prove that R is an equivalence relation in $N \times N$. -OR -

b) Show that the function f: $[0, \infty) to [5, \infty)$ defined by f(x) =$x^2 + 4x + 5$, is a one-one function. Is f onto? Why?

33 Solve using matrices: $3x - y - z = 3,\ x + y + z = 5, x - 2y + z = 2$

34 a)Find $\frac{dy}{dx}$ of the function $x^y + x^x + y^x = a^b$

- OR -

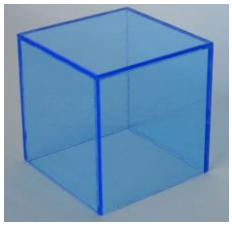
b) If y = $e^{a\cos^{-1}x}$, show that $(1-x^2)\frac{d^2y}{dx^2} - x\frac{dy}{dx} - a^2y = 0$

35 Integrate the function $\int \frac{1}{\cos(x-a)\cos(x-b)}$ dx

SECTION – E

(CASE STUDY - Each Question Carries 4 Marks)

36 A carpenter needs to make a cubical wooden box, closed from all sides, which has square base and fixed volume. Since he is short of the paint required to paint the box on completion, he wants the surface area to be minimum. On the basis of above information, answer the following.



(i) Find a relation between x and y, such that S is minimum. (2m)

(ii) If the surface area S is constant, the volume V= $\frac{1}{4}(Sx - 2x^3)$, x being the edge of the base, show that volume V is maximum when $x = \sqrt{\frac{S}{6}}$. (2m)

37 On her birthday Anu decided to donate some money to children of an orphanage

If there are 8 children less, everyone gets ₹ 10 more. However, if there are 16 children more, everyone gets ₹ 10 less.

Let the number of children in the orphanage home be x and the amount to be donated to each child be ₹ y.

Based on the above information, answer the following:

(i) Express the information provided above in system of linear equations. (1m)

(ii) Express the system of linear equations obtained in (i) as matrix equation. (1m)

(iii) (a) Find the number of children (x) and the amount to be donated to each child(y). (2m)

(iv) -OR-

(b) If A and B are symmetric matrices then prove that AB – BA is a skew symmetric matrix. (2m)

38 A MOTO GT organization conducted bike race under two different categories - Boys and Girls. There were 28 participants in all. Among all of them, finally three from category 1 and two from category 2 were selected for the final race. Ravi forms two sets B and G with these participants for his college project.

Let B = $\{b_1, b_2, b_3\}$ and G = $\{g_1, g_2\}$, where B represents the set of Boys selected and G the set of Girls selected for d for the final race..

(i) How many relations are possible from B to G? (1m)

(ii) Among all the possible relations from B to G, how many functions can be formed from B to G? (1m)

(iii) (a) Let R : B → B be defined by
R ={(x, y) : x and y are students of the same sex}.
Check if R is an equivalence relation in B or not. (2m)

- OR -

(b) A function f: B → G be defined by f ={$(b_1, g_1), (b_2, g_2), (b_3, g_1)$}.
Check if f is bijective, Justify your answer. (2m)

ANSWER KEY

Q1.	a	Q2.	b	Q3.	d	Q4.	c	Q5.	c
Q6.	d	Q7.	d	Q8.	a	Q9.	b	Q10.	b
Q11.	b	Q12.	d	Q13.	b	Q14.	b	Q15.	c
Q16.	c	Q17.	d	Q18.	b	Q19.	D	Q20.	C

Q21.	x= -2
Q22.	$\int \frac{(x+1)(x+logx)}{x}dx = \frac{(x+logx)^2}{2} + C$ OR $\int cos2x.cos4xdx = \frac{1}{2}\left(\frac{sin6x}{6} - \frac{sin2x}{2}\right) + C$
Q23.	$\pi + \frac{\pi}{4} + \frac{\pi}{4} = \pi + \frac{2\pi}{4} = \pi + \frac{\pi}{2} = \frac{3\pi}{2}$ OR $[-\sqrt{5}, -\sqrt{3}] \cup [\sqrt{3}, \sqrt{5}]$
Q24.	No. f is not one to one.
Q25.	a=3, b= -8
Q26.	$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{-2(3+2\log t)/t^3}{-(1+2\log t)/t^3}$ $\frac{dy}{dx} = \frac{2(3+2\log t)}{1+2\log t}$
Q27.	$\int \frac{2x}{(x^2+1)(x^2+4)}dx = \frac{1}{3}log\left\|\frac{x^2+1}{x^2+4}\right\| + C$ *Hint: Let x^2=t, and partial fraction.* *OR* $\int \frac{2x+3}{(x^2+2x+2}dx = log\|x^2+2x+2\| + tan^{-1}(x+1) + C$ *(Hiint: Numerator = A (derivative of denominator) +B*
Q28.	8/3 cm^2/s OR $\frac{27}{8}\pi(2x+1)^2$
Q30.	$\begin{bmatrix} 1 & 3 & -5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix} = \begin{bmatrix} 1 & -3/2 & -9/2 \\ -3/2 & 8 & 9/2 \\ -9/2 & 9/2 & 5 \end{bmatrix} + \begin{bmatrix} 0 & 9/2 & -1/2 \\ -9/2 & 0 & -3/2 \\ 1/2 & 3/2 & 0 \end{bmatrix}$

Q33.	$x = 2, y = 1$ *and* $z = 2$
Q34.	a) $\frac{dy}{dx} = \frac{-[y^x \log y + y \,.\, x^{y-1} + x^x(1+\log x)]}{x \,.\, y^{x-1} + x^y \log x}$
Q35.	Given $\frac{1}{\cos(x-a)\cos(x-b)}$ $= \frac{1}{\sin(a-b)}\left[\frac{\sin(a-b)}{\cos(x-a)\cos(x-b)}\right]$ $= \frac{1}{\sin(a-b)}\left[\frac{\sin(x-b)-(x-a)}{\cos(x-a)\cos(x-b)}\right]$ $= \frac{1}{\sin(a-b)}\frac{\sin(x-b)\cos(x-a)-\cos(x-b)\sin(x-a)}{\cos(x-a)\cos(x-b)}$ $= \frac{1}{\sin(a-b)}[\tan(x-b)-\tan(x-a)]$ $\int \frac{1}{\cos(x-a)\cos(x-b)}\,dx = \frac{1}{\sin(a-b)} log \left\lvert\frac{\cos(x-a)}{\cos(x-b)}\right\rvert + C$
Q36.	$S = 2x^2 + \frac{4V}{x}$ $\quad \frac{dS}{dx} = 4x - \frac{4V}{x^2}$ $x = y$
Q37.	i) 10x-8y =80, -10x+ 16y =160 ii) $\begin{bmatrix} 10 & -8 \\ -10 & 16 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 80 \\ 160 \end{bmatrix}$ iii) x=32 y= 30
Q38.	i) 64 ii) 8 iii) a) YES Or iii) b. NO

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