INDIAN SCHOOL AL WADI AL KABIR

Unit test (2023-2024)

Class: XII   Sub: MATHEMATICS (041)   Max Marks: 30

Date: 01.06.2023   Time: 1 hr.

General Instructions:
1. This question paper is divided in to 4 sections- A, B, C and D.
2. Section A comprises of 7 questions of 1 mark each.
3. *Section B comprises of 3 questions of 2 marks each.*
4. *Section C comprises of 3 questions of 3 marks each.*
5. *Section D comprises of 2 case study-based question.*
6. *Internal choice has been provided.*

SECTION A

Q.1.	If $\begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ 2 \end{bmatrix}$, then the value of $(2x + y - z)$ is :								1
d	**A**	1	**B**	2	**C**	3	**D**	5	
Q2.	**Let R be the relation in the set N given by R = {(a, b) : a = b – 2, b > 6}, then**								1
c	**A**	(2,4) ∈ R	**B**	(3,8) ∈ R	**C**	(6,8) ∈ R	**D**	(8,7) ∈ R	
Q3.	The value of $\tan^{-1}\sqrt{3} + \cot^{-1}\left(-\frac{1}{\sqrt{3}}\right)$ is equal to								1
a	**A**	π	**B**	$-\frac{\pi}{3}$	**C**	$-\pi$	**D**	$\frac{\pi}{6}$	
Q4.	**$\sin\left\{2\cos^{-1}\left(-\frac{3}{5}\right)\right\}$ is equal to**								1
d	**A**	6/25	**B**	24/25	**C**	4/5	**D**	-24/25	
Q5.	**If a matrix A is both symmetric and skew-symmetric, then**								1
b	**A**	A is a diagonal matrix	**B**	A is a zero matrix	**C**	A is a scalar matrix	**D**	A is a square matrix	
Q6.	**Let A = {1, 2, 3} and consider the relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (2, 3), (1, 3)}. Then R is**								1
a	**A**	reflexive but not symmetric	**B**	reflexive but not transitive	**C**	symmetric and transitive	**D**	neither symmetric, nor transitive	

Q7	In the following question 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.	1
	Assertion (A): If A and B are symmetric matrices then AB – BA is a skew symmetric matrix. Reason (R): For a skew symmetric matrix A= $[a_{ij}]$, $a_{ij} = 0 \; if \; i = j$.	
	SECTION B	
Q8.	Compute the indicated product: $\begin{bmatrix} 3 & 2 \\ 1 & 4 \\ 5 & 3 \end{bmatrix} \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$	2
Q9.	Find the value of k for which the function $$f(x) = \begin{cases} \frac{\sin x - \cos x}{4x - \pi}, & x \neq \frac{\pi}{4} \\ k & x = \frac{\pi}{4} \end{cases}$$ is continuous as $x = \frac{\pi}{4}$ Or If $x^y = y^x$, then find $\frac{dy}{dx}$	2
Q10.	Prove that the relation R on the set N X N defined by (a, b) R (c, d), if $ad = bc$, for all (a, b), (c, d) ϵ N X N is an equivalence relation.	2
	SECTION C	
Q11.	If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ then prove A² − 3A − 7I = 0	3
Q12.	If $x\sqrt{1+y} + y\sqrt{1+x} = 0$, then prove that $\frac{dy}{dx} = -\frac{1}{(1+x)^2}$ OR If $(x^2+y^2)^2 = xy$, then find $\frac{dy}{dx}$.	3
Q13.	Show that the function $f(x) = \frac{5x-3}{4}, f : R \; to \; R$ is both one to one and onto.	3

SECTION D Case study-based questions		

Q14 | A manufacturer produces three stationery products Pencil, Eraser and Sharpener which he sells in two markets. Annual sales are indicated below

Market	Products (in numbers)		
	Pencil	Eraser	Sharpener
A	10,000	2,000	18,000
B	6,000	20,000	8,000

If the unit Sale price of Pencil, Eraser and Sharpener are ₹ 2.50, ₹ 1.50 and ₹ 1.00 respectively, and unit cost of the above three commodities are ₹ 2.00, ₹ 1.00 and ₹ 0.50 respectively, then,

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(i) Find the total revenue of market A.
(ii) Find the total revenue of market B
(iii) What is the cost incurred in market A
        Or
    Profit earned in market A and B.

1
1
2

Q15 Hari visited an exhibition along with his family. The exhibition had a huge swing. Hari found that the swing traced the path of a Parabola as given by $f(x) = x^2 + 1$

Answer the following questions based on the above informations

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a) What is the range of $f(x) = x^2 + 1$
b) If $f(x) = x^2 + 1, if\ x \geq 0, then\ find\ the\ preimage\ of\ 9.$
c) Show that $g(x) = |x|$ is continuous but not differntiable at $x = 0$
   OR
c) Determine whether $h(x) = x^2 + 2x + 2, f: [0, \infty) to\ [0, \infty)\ is\ onto.$ If not modify the codomain so that h(x) becomes an onto function.

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