INDIAN SCHOOL AL WADI AL KABIR

Sample paper -1

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

Date: 06-11-2022 Time: 3 hours

General Instructions:

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/integrated units of assessment (4 marks each) with sub parts.*

Section A

MCQ's

Q.1 $|\vec{a}|=8, \left|\vec{b}\right| = 3 \; and \; \left|\vec{a} \times \vec{b}\right| = 12, then \; \vec{a}.\vec{b}$

A $6\sqrt{3}$ B $8\sqrt{3}$ C $9\sqrt{3}$ D $12\sqrt{3}$

Q.2 Value of $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+a & 1 \\ 1 & 1 & 1+b \end{vmatrix}$ *is*

A a +b B a - b C ab D None of these

Q.3 If three dice are thrown together, probability of getting at least one odd number is

A $\frac{1}{8}$ B $\frac{7}{8}$ C $\frac{1}{216}$ D $\frac{3}{8}$

Q.4 $(\hat{\imath} \times \hat{\jmath}).(\hat{\jmath} \times \hat{k}) + \hat{\imath}.\hat{\imath} =$

A 1 B 2 C 0 D -1

Q.5 $sin^{-1}\left(sin\frac{2\pi}{3}\right) + cos^{-1}(cos\frac{13\pi}{6})$ =

A $\frac{7\pi}{6}$ B $\frac{2\pi}{3}$ C $\frac{\pi}{2}$ D $\frac{5\pi}{6}$

Q.6 Any point in the feasible region that gives the optimal value (maximum or minimum) of the objective function is called ...

A objective B optimal solution C domain D constraint

Q.7 The corner points of the feasible region determined by the system of linear constraints are (0, 10), (5, 5) (15, 15) and (0, 20). Let Z= px + qy, where p, q> 0. Condition on p and q so that the maximum of Z occurs at both the points (15, 15) and (0, 20) is

A $p = q$ B $p = 2q$ C $q = 2p$ D $q = 3p$

Q.8 $\int sin^{-1}(cosx)\, dx =$

A cos x +C B $\frac{\pi}{2}x - \frac{x^2}{2}$ +c C sinx +c D cotx + c

Q.9 $If\ A = \begin{bmatrix}3 & 4\\ 2 & 3\end{bmatrix}\ and\ B = \begin{bmatrix}-2 & -2\\ 0 & -1\end{bmatrix}\ then\ (A+B)^{-1} is$

A $\begin{bmatrix}-1 & 1\\ 1 & -\frac{1}{2}\end{bmatrix}$ B Does not exist C A skew symmetric D None of these

Q.10 If a line makes angles $\alpha, \beta, \gamma\ with\ the\ positive\ direction\ of\ coordinate\ axes, then\ write$ the value of $sin^2\alpha + sin^2\beta + sin^2\gamma$.

A 0 B 1 C -1 D 2

Q.11 The value of x if $A\ is\ a\ singular\ maatrix, where\ A = \begin{pmatrix}1 & 0 & 2\\ 0 & 1 & -2\\ x & 2 & 0\end{pmatrix}$

A 4 B -4 C 2 D -2

Q.12 Write adjoint of the matrix A = $\begin{pmatrix} 3 & 4 \\ 0 & -5 \end{pmatrix}$.

A $\begin{pmatrix} 3 & 4 \\ 0 & -5 \end{pmatrix}$ B $\begin{pmatrix} -3 & 4 \\ 0 & 5 \end{pmatrix}$ C $\begin{pmatrix} -5 & -4 \\ 0 & 3 \end{pmatrix}$ D $\begin{pmatrix} 3 & 4 \\ 0 & -5 \end{pmatrix}$

Q.13 $If\ y = log(x), then\ \frac{d^2y}{dx^2}$

A $\frac{x}{logx}$ **B** $\frac{logx}{x}$ **C** $-\frac{1}{x^2}$ **D** $\frac{1}{x}$

Q.14 $The\ function\ f(x) = \begin{cases} \frac{sin3x}{x}, x \neq 0 \\ \frac{k}{2}, x = 0 \end{cases}$ $is\ continuous\ at\ x = 0\ .Then\ value\ of\ k$

A 6 **B** 9 **C** 12 **D** 3

Q.15 Evaluate: $\int_{-1}^{1}(x^3 + xcosx + tanx + 1)\,dx$

A 0 B 2 C 1 D $\frac{\pi}{4}$

Q.16 Write the sum of the order and degree of the differential equation

$sinx + \left(\frac{dy}{dx}\right)^3 = \left(\frac{d^2y}{dx^2}\right)^3$

A 4 B 5 C 6 D None of these

Q.17 The general solution of the differential equation $\frac{dy}{dx} = e^{x+y}$

A $e^x + e^{-y} = c$ B $e^{x+y} = c$ C $e^x + e^y = c$ D $e^x - e^{-y} = c$

Q.18 The magnitude of vector PQ if P (1, 2, 3) and B (2, 4, 1).

A 1 B 2 C 3 D 4

ASSERTION-REASON 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.

Q.19 The angle between the lines whose directions ratios are a, b, c and b-c, c-a, a-b

A $\frac{\pi}{2}$ R $sum\ of\ the\ products\ of\ corresponding\ DR's = 0$

Q.20 $The\ lines\ \frac{x}{2} = \frac{y}{4} = \frac{z}{2} = t\ and\ \frac{x-1}{1} = \frac{y-2}{2} = \frac{z}{2} = s\ are$

A parallel R Both the lines passing through origin

SECTION B (2 marks)

Q.21 Check whether the function $f: N\ to\ R\ defined\ by\ f(x) = x^2$ is bijective or not?

Q.22 $If\ x = \sqrt{a^{sin^{-1}t}}, y = \sqrt{a^{cos^{-1}t}}, then\ \frac{dy}{dx}$

Q.23 Find the intervals in which the function $f(x) = sinx + cosx, x \in (0,\ \pi)$ is strictly increasing and decreasing.

Q.24 Find the projection of the vector $\hat{\imath} + 3\hat{\jmath} + 7\hat{k}\ on\ the\ vector\ 7\hat{\imath} - \hat{\jmath} + 8\hat{k}$.

OR

Find area of parallelogram whose adjacent sides are $\hat{\imath} + 3\hat{\jmath} + 2\hat{k}\ and\ 3\hat{\imath} + \hat{\jmath} + \hat{k}$.

Q.25 Write equation of a line passing through (1, 2, 3) and (4, -1, 5) in vector form and cartesian form.

SECTION C (3 marks)

Q.26 $Evaluate: \int \frac{e^{2x}-1}{e^{2x}+1} dx$ OR Evaluate: $\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} \frac{1}{1-cos2x}\, \boldsymbol{dx}$

Q.27 $Evaluate: \int \left(\frac{e^x}{(e^{2x}+1)}\right) dx \ OR \ \int e^x \left(\frac{1-sin2x}{1-cos2x}\right) dx$

Q.28 $Evaluate: \int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \frac{1}{1+\sqrt{tanx}} dx$

Q.29 $Solve\ the\ differential\ equation: x\frac{dy}{dx} - y = x^2.$

Q.30 Solve the following LPP graphically: $Maximise: Z = 2x + 3y$

Subject to the constrains: $3x + 4y \leq 60$

$x + 3y \leq 30, x + y \geq 5, x \geq 0\ and\ y \geq 0$

Q31 The probability distribution of X is given below.

X	0	1	2	3	4
P(X)	0.1	k	2k	2k	k

Find (i) the value of k (ii) P(1<x<4)

Section D (5 marks)

Q.32 Let R be the relation in the set A of integers given by R = {(a, b): 2 divides a – b}. Show that the relation R is an equivalence relation? Write the equivalence class [0].

Q.33 If A = $\begin{bmatrix} 1 & 1 & 2 \\ 1 & -2 & 0 \\ 3 & -1 & 1 \end{bmatrix}$ find A^{-1} and hence solve the system of equations

x +y +2z = 5; x - 2y =0 and 3x -y + z = 6 .

Q.34 Find the area of the region bounded by the line y = 3x + 2, the x-axis and the ordinates x = –1 and x = 1.

OR

Find the smaller area bounded by $the\ curve\ 4x^2 + 9y^2 = 36\ and\ the\ line\ 2x + 3y = 6.$

Q.35 Find the coordinates of the foot of perpendicular drawn from the point $A(1, 6, 3)$ to the line $\frac{x}{1} = \frac{y-1}{2} = \frac{z-2}{3}$. Hence find the image of the point A in the given line.

OR

Prove that the lines $\frac{x-4}{4} = \frac{y-5}{6} = \frac{z-1}{2}\ and\ \frac{x-3}{7} = \frac{y-9}{5}; z = 4$ intersect each other. Hence find the point of intersection.

Section E Case study-based Question (4 marks)

Q.36 A tank with rectangular base and rectangular sides, open at the top is to be constructed so that its depth is 4 m and volume is 64 m^3.

a) If x and y represents the length and breadth of the rectangular base, then find area of the metal sheet required for the tank in terms of x and y.
b) Find the dimensions of the least expensive tank.
c) Find minimum area of sheet required for the tank? OR

Find the cost of metal sheet for least expensive tank at the rate of □500 per square metre.

Q.37 An insurance company insured 2000 scooter drivers, 3000 car drivers and 5000 truck drivers. The probability of an accidents is 0.01, 0.03 and 0.15 respectively.

Let E_1, E_2 and E_3 be the sets of scooter drivers, car drivers and truck drivers respectively and A be the event "an accident is reported"

a) $Evaluate\ P(E_1)$
b) Evaluate $P(A/E_1) + P(A/E_2)$
c) Evaluate P(A). OR
If one of the insured driver meet with an accident. What is the probability that he is a scooter driver?

Q.38 P(x) = $-5x^2 + 125x + 37500$ is the total profit function of a company, where x is the production of the company.

a) When the production is 2 units, what will be the profit of the company?
b) Check in which interval the profit is strictly increasing?
c) What is the production when the profit is maximum? OR
What is the maximum profit?

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