INDIAN SCHOOL AL WADI AL KABIR

Unit test (2023-2024)

Class: XII Sub: APPLIED MATHEMATICS (241) 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.** | $If\ A = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{pmatrix}\ then\ \lvert A\rvert + \lvert adjA\rvert =$ _____ | | | | | | | | 1 |
| | **A** | 3 | **B** | 9 | $C$ | 12 | **D** | 27 | |
| **Q2.** | For the binomial distribution $B(9, \frac{1}{3})$, $standard\ deviation\ =$ __ | | | | | | | | 1 |
| | **A** | 3 | **B** | 1 | $C$ | 2 | **D** | 1.41 | |
| **Q3.** | $The\ derivative\ of\ x^x with\ respect\ to\ x\ is$ _____ | | | | | | | | 1 |
| | **A** | $x^x(1+logx)$ | **B** | $1+logx$ | $C$ | $x^x$ | **D** | $x^x logx$ | |
| **Q4.** | $The\ slope\ of\ the\ tangent\ to\ the\ curve\ = x^3 - 3x\ \ is\ equal\ to\ zero\ at$ | | | | | | | | 1 |
| | **A** | (1, 2) and (2, 2) | B | (1, -2) and (-1, 2) | $C$ | (3, 18) | **D** | (-3, -18) | |
| **Q5.** | If X is a Poisson variable such that $P(X=1) = 2\,P(X=2)$, $then\ P(X=0)\ is$ _____ | | | | | | | | 1 |
| | **A** | $e$ | **B** | $\frac{1}{e}$ | C | 1 | **D** | $e^2$ | |
| **Q6.** | $If\ A(3,4), B(0,-4) and\ C(-1,0)\ then\ area\ of\ \Delta ABC\ is$___ sq. units. | | | | | | | | 1 |
| | A | 10 | B | 20 | C | 4 | D | 12 | |

| | | |
|---|---|---|
| **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.<br>A) Both A and R are true and R is the correct explanation of A.<br>B) Both A and R are true but R is not the correct explanation of A.<br>C) A is true but R is false.<br>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.<br>Reason (R): For a skew symmetric matrix A= $[a_{ij}], a_{ij} = 0\ if\ i = j.$ | |
| | SECTION B | |
| **Q8.** | Solve for x and y using Cramer's rule: $3x - 4y = 0 \quad 2x - 3y = -1$ .<br>**OR**<br>$If\ A = \begin{pmatrix} 1 & 0 & -2 \\ 2 & 1 & -1 \\ 1 & 1 & 3 \end{pmatrix}\ evaluate\ adjA.$ | 2 |
| **Q9.** | A stationery company manufactures 'x' units of pen in a given time. If the cost of raw material is square of the pens produced, cost of transportation is twice the number of pens produced and the property tax costs ₹ 5000, then,<br>(i) find the cost function C(x).<br>(ii) find the marginal cost of producing 50 pens. | 2 |
| **Q10.** | Express the matrix $A = \begin{pmatrix} 4 & -2 & 0 \\ 8 & 0 & -3 \\ 2 & 2 & 1 \end{pmatrix}$<br>$as\ \ sum\ of\ a\ symmetric\ matrix\ and\ a\ skew\ symmetric\ matrix$ | 2 |
| | SECTION C | |
| **Q11.** | Two numbers are selected at random without replacement from the set of natural numbers 1, 2, 3, 4 and 5. If X denotes the greater number obtained,<br>i) prepare the probability distribution of random variable X<br>ii) find the mathematical expectation of X. | 3 |
| **Q12.** | $If\ x\sqrt{1+y} + y\sqrt{1+x} = 0, then\ prove\ that\ \frac{dy}{dx} = -\frac{1}{(1+x)^2}$<br>OR<br>$If\ x^2y^3 = (x+y)^5\ prove\ that\ \frac{dy}{dx} = \frac{y}{x}\ and\ \frac{d^2y}{dx^2} = 0$ | 3 |

**Q13.** If the probability that an individual suffers a bad reaction from a injection of a given serum is 0.001. Determine the probability that out of 2000 individuals — 3

i) exactly 3 individuals will suffer from a bad reaction.
ii) more than 2 individuals will suffer from a bad reaction.

(Use $e^{-2} = 0.1353$)

SECTION D Case study-based questions

**Q14** — 4

In an election, a political group hired a public relation firm to promote their candidate in three ways: telephone, house calls and letters. The cost per contact is given as follows:
Telephone ₹ 0.10, House call ₹ 1.00 and letter ₹ 2.00.
If the number of contacts made in two cities X and Y are given below:


| City | Telephone | House call | Letter |
|---|---|---|---|
| X | 1000 | 500 | 5000 |
| Y | 3000 | 1000 | 10,000 |

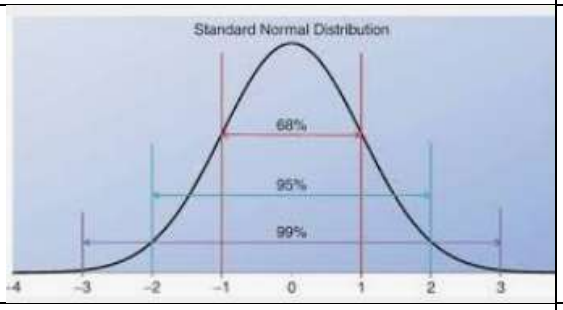
a) *If A is a* $2 \times 3$ *matrix and B is a* $3 \times 1$, what is the order of matrix AB?
b) What is the total amount spent on telephone calls by the political group in both the cities together?
c) Using matrices find the total amount spent in each cities X and Y.

**OR**

Find A if $A\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & 1 \\ 6 & 3 \end{bmatrix}$.

**Q15** — 4

The test scores of a university entrance test appeared by 3000 students are normally distributed with mean 200 marks and standard deviation 20 marks. Based on the above information answer the following:




a) Find the Z score of the mark 100.
b) If Hari scored 180 marks what can you conclude about his performance compared to his batchmates?
c) Find out the number of students expected to score above 220. OR
c) If 5% of the total students are qualified for the admission, find the minimum marks required to get the admission.

[Given: P(Z$< -1) = 0.1587$ & $P(Z \leq 1.65 = 0.95]$

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