



INDIAN SCHOOL MUSCAT
SECOND PRE-BOARD EXAMINATION
MATHEMATICS (041)

CLASS: XII

TERM - II

Time Allotted: 2 hours.

02.03.2022

Max. Marks: 40

General Instructions:

1. This question paper contains **three sections – A, B and C**. Each part is compulsory.
2. **Section - A** has 6 **short answer type (SA1) questions** of 2 marks each.
3. **Section – B** has 4 **short answer type (SA2) questions** of 3 marks each.
4. **Section - C** has 4 **long answer type questions (LA)** of 4 marks each.
5. There is an **internal choice** in some of the questions.
6. Q14 is a **case-based problem** having 2 sub parts of 2 marks each.

SECTION A

- 1) Evaluate: $\int_{-1}^2 [x] dx$ 2
- 2) Find the general solution of the following differential equations: 2
 $\frac{dy}{dx} = e^{x+y}$
- OR**
- $\frac{dy}{dx} + 3y = e^{-3x}$
- 3) Find a vector in the direction of vector $\vec{a} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ that has magnitude 13 units. 2
- 4) Find the distance of a point (2, 5, -3) from the plane $\vec{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4$ 2
- 5) A fair die is rolled. Consider events $E = \{1, 3, 5\}$, $F = \{2, 3\}$ and $G = \{2, 3, 4, 5\}$, Find 2
 (i) $P((E \cup F)/G)$
 (ii) $P((E \cap F)/G)$
- 6) Two Cards are drawn Simultaneously from a well shuffled deck of cards. Find the probability distribution of the number of successes when getting a spade is considered a success. 2

SECTION B

- 7) Evaluate: $\int \frac{x}{(x-1)(x-2)} dx$ 3
- 8) Solve for the particular solution: $(x^2 - y^2)dx + 2xydy = 0$; $y(1) = 1$ 3

- 9) If $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$, $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$ then find a vector \vec{d} which is perpendicular to both \vec{a} and \vec{b} & $\vec{c} \cdot \vec{d} = 15$ 3

OR

If \hat{a} and \hat{b} are unit vectors inclined at an angle θ , then prove that $\sin \frac{\theta}{2} = \frac{1}{2} |\hat{a} - \hat{b}|$

- 10) Find the shortest distance between two lines: 3
 $\vec{r} = \hat{i} + 2\hat{j} + 3\hat{k} + \lambda(\hat{i} - 3\hat{j} + 2\hat{k})$ and $\vec{r} = 4\hat{i} + 5\hat{j} + 6\hat{k} + \mu(2\hat{i} + 3\hat{j} + \hat{k})$

OR

Find x such that the four points A (3,2,1), B (4, x, 5), C (4, 2, -2) and D (6, 5, -1) are coplanar.

SECTION C

- 11) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$ 4

OR

Evaluate: $\int_1^4 \{|x - 1| + |x - 2| + |x - 3|\} dx$

- 12) Find the area of the region enclosed by the parabola $x^2 = y$, the line $y = x + 2$ and the x-axis. 4
- 13) Find the coordinate of the point P where the line through A (3, -4, -5) and B (2, -3, 1) crosses the plane passing through three points L(2, 2, 1), M(3, 0, 1) and N(4, -1, 0). 4

CASE-BASED / DATA-BASED

- 14) A shopkeeper sells three type of flower seeds: yellow tulips, blue tulips and pink tulips. He sold these seeds as a mixture in the ratio 4 : 4 : 2, respectively. The germination rates of the three types of seeds are 45%, 60%, and 35% respectively.



- (i) Calculate the probability of a randomly chosen seed to germinate. 2
 (ii) A seed is selected at random and is found to have germinated, what is the probability that it is a blue tulip seed? 2

End of the Question Paper



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OR

$\frac{dy}{dx} + 3y = e^{-3x}$

3) Find a vector in the direction of vector $\vec{a} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ that has magnitude 13 units. 2

4) Find the distance of a point (2, 5, -3) from the plane $\vec{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4$ 2

5) A fair die is rolled. Consider events $E = \{1, 3, 5\}$, $F = \{2, 3\}$ and $G = \{2, 3, 4, 5\}$, Find 2
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OR

If \hat{a} and \hat{b} are unit vectors inclined at an angle θ , then prove that

$$\sin \frac{\theta}{2} = \frac{1}{2} |\hat{a} - \hat{b}|$$

- 10) Find the shortest distance between two lines: 3
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- 13) Find the coordinate of the point P where the line through $A(3, -4, -5)$ and $B(2, -3, 1)$ crosses the plane passing through three points $L(2, 2, 1)$, $M(3, 0, 1)$ and $N(4, -1, 0)$. 4

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OR

$$\frac{dy}{dx} + 3y = e^{3x}$$

- 3) Find a vector in the direction of vector $\vec{a} = 3\hat{i} + 4\hat{j} - 2\hat{k}$ that has magnitude 13 units. 2
- 4) Find the distance of a point $(2, 5, 3)$ from the plane $\vec{r} \cdot (6\hat{i} - 3\hat{j} + 2\hat{k}) = 4$ 2
- 5) Given that events A and B are such that $P(A) = 1/2$, $P(B) = p$, $P(A \cup B) = 3/5$. Find p if they are 2
 (i) Mutually exclusive
 (ii) independent.
- 6) Two Cards are drawn Simultaneously from a well shuffled deck of cards. Find the probability distribution of the number of successes when getting a spade is considered a success. 2

SECTION B

- 7) Evaluate: $\int \frac{x}{(x+1)(x+2)} dx$ 3
- 8) Solve for the particular solution : $(x^2 - y^2)dx + 2xydy = 0$; $y(1) = 1$ 3
- 9) $\vec{a} = \hat{i} + 4\hat{j} + 2\hat{k}$, $\vec{b} = 3\hat{i} - 2\hat{j} + 7\hat{k}$, $\vec{c} = 2\hat{i} - \hat{j} + 4\hat{k}$, Find a vector \vec{d} which is perpendicular to both \vec{a} and \vec{b} & $\vec{c} \cdot \vec{d} = 15$ 3

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- 10) Find the shortest distance between two lines:

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$$\vec{r} = \hat{i} - 2\hat{j} + 3\hat{k} + \lambda(-\hat{i} + \hat{j} - 2\hat{k}) \text{ and } \vec{r} = \hat{i} - \hat{j} - \hat{k} + \mu(\hat{i} + 2\hat{j} - 2\hat{k})$$

OR

Find x such that the four points A (3,2,1) B(4, x, 5). C (4, 2, -2) and D (6, 5, -1) are coplanar.

SECTION C

- 11) Evaluate: $\int_0^{\frac{\pi}{2}} \frac{\sin^2 x}{\sin x + \cos x} dx$

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OR

$$\text{Evaluate: } \int_1^4 \{|x-1| + |x-2| + |x-3|\} dx$$

- 12) Find the area bounded by the curve $x^2 = 4y$ and the line $x = 4y - 2$

4

- 13) Find the coordinate of the point P where the line through $A(3, -4, -5)$ and $B(2, -3, 1)$ crosses the plane passing through three points $L(2, 2, 1)$, $M(3, 0, 1)$ and $N(4, -1, 0)$.

4

CASE-BASED/DATA-BASED

- 14) In answering a question on a multiple-choice test for class XII, a student either knows the answer or guesses. If $3/5$ is the probability that he knows the answer and $2/5$ be the probability that he guesses. Assume that a student who guesses at the answer will be correct with probability $1/3$.



Based on the given information, answer the following questions.

A randomly selected question is attempted by the student

(i) What is the probability that the student answered it correctly?

2

(ii) What is the probability that the student knows the answer given that he answered it correctly?

2

End of the Question Paper