

Series-C

Roll No.....



(GRAPH PAPER)

Total No. of Questions-34]

[Total No. of Printed Pages-16

A-857-C-XII-2325

MATHEMATICS

Time Allowed—3 Hours

Maximum Marks—80

Candidates are required to give their answers in their own words as far as practicable.

Marks allotted to each question are indicated against it.

Special Instructions :

- (i) You must write Question Paper Series in the circle at the top left side of title page of your Answer-book.
- (ii) While answering your Questions, you must indicate on your Answer-book the same Question No. as appears in your Question Paper.

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- (iii) Do not leave blank page/pages in your Answer book.
- (iv) All questions are compulsory.
- (v) This question paper contains four sections A, B, C, & D. Each section is compulsory.
- (vi) Section-A has 13 MCQ (Multiple Choice Questions) and 3 Assertion, Reason based questions of 1 mark each.
- (vii) Section-B has 12 Very Short answer questions of 3 marks each i.e. Question Nos. 17 to 28.
- (viii) Section-C has 2 Short answer questions of 4 marks each i.e. Question Nos. 29 & 30.
- (ix) Section-D has 4 Long answer questions of 5 marks each i.e. Question Nos. 31 to 34.
- (x) Graph paper must be attached in between the Answer-book.
- (xi) All questions given in Section-A (Multiple Choice Questions) are to be attempt on OMR sheet provided with Answer book.

SECTION-A

1. Let $f : \mathbb{R} \rightarrow \mathbb{R}$ be defined as $f(x) = x^3$. Choose the correct answer : 1

- (a) f is one-one onto
- (b) f is many-one onto
- (c) f is one-one but not onto
- (d) f is neither one-one nor onto.

2. If $\cos^{-1} x = y$, then : 1

- (a) $0 \leq y < \pi$
- (b) $0 \leq y \leq \pi$
- (c) $-\frac{\pi}{2} \leq y \leq \frac{\pi}{2}$
- (d) $-\frac{\pi}{2} < y < \frac{\pi}{2}$

3. The value of $\cos^{-1}\left(\cos\frac{7\pi}{6}\right)$ is equal to: 1

- (a) $\frac{7\pi}{6}$
- (b) $\frac{5\pi}{6}$
- (c) $\frac{\pi}{3}$
- (d) $\frac{\pi}{6}$

4. $A = [a_{ij}]_{m \times n}$ is a square matrix if : 1

- (a) $m < n$
- (b) $m > n$
- (c) $m = n$
- (d) None of these.

5. The element a_{33} of a 3×3 matrix $A = [a_{ij}]$ where $a_{ij} = 2i - j$ is : 1

- (a) 0
- (b) 1
- (c) 3
- (d) 4.

6. The derivative of $\cos^{-1}(e^x)$ w.r.t. 'x' is: 1

(a) $\sin^{-1}(e^x) \cdot e^x$

(b) $\frac{-e^x}{\sqrt{1 - e^{2x}}}$

(c) $\frac{e^x}{\sqrt{1 - e^{2x}}}$

- (d) None of these.

7. The rate of change of the area of the circle with respect to its radius 'r' where $r = 6$ cm is : 1
- (a) $10\pi \text{ cm}^2 / \text{cm}$ (b) $12\pi \text{ cm}^2 / \text{cm}$
- (c) $8\pi \text{ cm}^2 / \text{cm}$ (d) None of these.
8. The interval in which the function $f(x) = x^2 - 4x + 6$ is increasing : 1
- (a) $(0, \infty)$ (b) $(-\infty, \infty)$
- (c) $(2, \infty)$ (d) $(-\infty, 0)$.
9. $\int \frac{\sin^2 x - \cos^2 x}{\sin^2 x \cdot \cos^2 x} dx$ is equal to : 1
- (a) $\tan x + \cot x + C$
- (b) $\tan x + \operatorname{cosec} x + C$
- (c) $-\tan x + \cot x + C$
- (d) $\tan x + \sec x + C$.
10. The degree of differential equation $\frac{d^4 y}{dx^4} - \sin\left(\frac{d^3 y}{dx^3}\right) = 0$ is : 1
- (a) 4 (b) 3
- (c) 0 (d) Not defined.

11. The integrating factor of

$$(1+x^2)dy + 2xy dx = \cot x dx \quad (x \neq 0) \text{ is :} \quad 1$$

- (a) $\log(1+y^2)$ (b) $1+y^2$
(c) $\log(1+x^2)$ (d) $1+x^2$.

12. If $\vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}|$, then ' θ ' = 1

- (a) $\frac{\pi}{4}$ (b) $\frac{\pi}{2}$
(c) 0° (d) π .

13. If a line has direction ratio $(2, -1, -2)$, then its Direction Cosines are : 1

- (a) $\left(\frac{2}{3}, \frac{-1}{3}, \frac{-2}{3}\right)$
(b) $\left(\frac{-2}{3}, \frac{-1}{3}, \frac{2}{3}\right)$
(c) $\left(\frac{-2}{3}, \frac{-1}{3}, \frac{-2}{3}\right)$
(d) None of these.

Assertion Reason based Question

In the following questions, a statement of Assertion(A) is followed by a Reason(R). Choose the correct answer out of the following from (Question No. 14 to 16) :

14. Assertion (A): The acute angle between the line

$$\vec{r} = \hat{i} + \hat{j} + 2\hat{k} + \lambda(\hat{i} - \hat{j}) \text{ and the x-axis is } \frac{\pi}{4}. \quad 1$$

Reason (R): The acute angle ' θ ' between the lines $\vec{r} = x_1\hat{i} + y_1\hat{j} + z_1\hat{k}$

$$+ \lambda(a_1\hat{i} + b_1\hat{j} + c_1\hat{k}) \text{ \& }$$

$$\vec{r} = x_2\hat{i} + y_2\hat{j} + z_2\hat{k}$$

$$+ \mu(a_2\hat{i} + b_2\hat{j} + c_2\hat{k})$$

is given by

$$\cos\theta = \frac{|a_1a_2 + b_1b_2 + c_1c_2|}{\sqrt{a_1^2 + b_1^2 + c_1^2} \sqrt{a_2^2 + b_2^2 + c_2^2}}$$

Options:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)

- (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)
- (c) Assertion (A) is true, but Reason (R) is false.
- (d) Both Assertion (A) and Reason (R) are false.

15. Assertion (A): The probability of drawing either an ace or a king from a pack of 52 playing card is $\frac{2}{13}$.

Reason (R): For two events A and B,

$$P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

Options:

- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A)
- (b) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A)