

Total Questions : 50

Time : 1 hr.

PATTERN & MARKING SCHEME

Section	(1) Logical Reasoning	(2) Mathematical Reasoning or Applied Mathematics	(3) Everyday Mathematics	(4) Achievers Section
No. of Questions	15	20	10	5
Marks per Ques.	1	1	1	3

SYLLABUS

Section – 1 : Verbal and Non-Verbal Reasoning.

Section – 2 : Relations and Functions, Inverse Trigonometric Functions, Matrices, Determinants, Continuity and Differentiability, Application of Derivatives, Integrals, Application of Integrals, Differential Equations, Vector Algebra, Three Dimensional Geometry, Linear Programming, Probability.

OR

Section – 2 : Numbers, Quantification, Numerical Applications, Solutions of Simultaneous Linear Equations, Matrices, Determinants, Application of Derivatives, Integration, Application of Integrations, Differential Equations, Probability, Inferential Statistics, Index numbers, Time-Based Data, Financial Mathematics, Linear Programming.

Section – 3 : The syllabus of this section will be based on the syllabus of Quantitative Aptitude.

Section – 4 : Matrices, Determinants, Application of Derivatives, Integration, Application of Integrations, Differential Equations, Linear Programming, Probability.

LOGICAL REASONING

1. In the following equation, two signs and two numbers need to be interchanged to make it correct. Select the correct interchange of signs and numbers from the given options.

$$1050 \times 60 \div 7 + 13 - 50 = 100$$

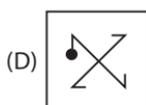
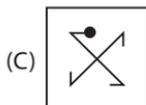
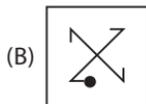
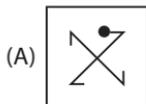
(A) \div , \times and 7, 50

(C) \times , \div and 60, 50

(B) \times , $-$ and 60, 7

(D) $+$, \div and 50, 13

2. Select the odd one out.



3. A number arrangement machine when given an input of numbers, rearranges them following a particular rule in each step. The following is an illustration of input and steps of rearrangement.

Input : 25 280 345 36 93 147 550

Step-I : 550 280 345 36 93 147 25

Step-II : 550 345 280 93 147 36 25

Step-III : 550 345 280 147 93 36 25

What will be the third step for the following input?

Input : 113 18 48 225 462 175 288

(A) 462 288 48 225 113 175 18

(B) 462 288 225 175 113 48 18

(C) 462 225 288 48 113 175 18

(D) 462 288 225 48 113 175 18

MATHEMATICAL REASONING

4. If A is skew-symmetric matrix of order 2 and B, C are matrices $\begin{bmatrix} 1 & 4 \\ 2 & 9 \end{bmatrix}$ and $\begin{bmatrix} 9 & -4 \\ -2 & 1 \end{bmatrix}$ respectively, then $A^3BC + A^5(B^2C^2) + A^7(B^3C^3) + \dots + A^{2n+1} B^n C^n$ is

(A) A skew-symmetric matrix

(B) A symmetric matrix

(C) An identity matrix

(D) None of these

5. Solve the differential equation $(x + y)dy + (x - y)dx = 0$, given that $y = 1$ when $x = 1$.

(A) $\log(x + y) + \frac{\pi}{2} = \log 2$

(B) $\log y^2 + \tan^{-1}\left(\frac{y}{x}\right) = \log 2$

(C) $\log(x^2 + y^2) + 2 \tan^{-1}\left(\frac{y}{x}\right) = \frac{\pi}{2} + \log 2$

(D) $\log x^2 + 2 \tan^{-1}\left(\frac{y}{x}\right) = \frac{\pi}{2}$

6. It has been found that if A and B play a game 12 times, A wins 6 times, B wins 4 times and they draw twice. A and B take part in a series of 3 games. The probability that they will win alternately is

(A) $\frac{5}{72}$

(B) $\frac{5}{36}$

(C) $\frac{19}{27}$

(D) None of these

APPLIED MATHEMATICS

4. Fit a straight line trend by the method of least square for the following data.

Years	2014	2015	2016	2017	2018	2019	2020
Profit (₹ '000)	110	134	126	144	138	156	164

- (A) $y_t = 218 + 28x$ (B) $y_t = 31.14 + 34.7x$
 (C) $y_t = 218 + 31.14x$ (D) $y_t = 138.86 + 7.79x$
5. For a Poisson's distribution, $3P(X = 2) = P(X = 4)$. Find $P(X = 3)$. (Use : $e^{-6} = 0.00248$)
 (A) 0.07297 (B) 0.08928
 (C) 0.06261 (D) 0.0216
6. The total cost $C(x)$ (in ₹) associated with the production of x units of an item is given by $C(x) = 0.007x^3 - 0.003x^2 + 15x + 4000$
 The marginal cost (approx.) when 17 units are produced, is
 (A) ₹ 20.98 (B) ₹ 21.97
 (C) ₹ 81.97 (D) ₹ 11.97

EVERYDAY MATHEMATICS

7. In a class, 25% of the students get a scholarship. There are 40 girls and 50% of them get a scholarship. If the girls constitute 25% of the strength of the class, then find the percentage of boys who get a scholarship.
 (A) 15% (B) 25%
 (C) 20% (D) None of these
8. A man 2 metres tall walks away from a lamp post 5 metres height at the rate of 4.8 km/hr. The rate of increase of the length of his shadow, is
 (A) 1.6 km/hr (B) 6.3 km/hr
 (C) 5 km/hr (D) 3.2 km/hr

ACHIEVERS SECTION

9. Read the given statements carefully and select the correct option.

Statement-I: The degree and order of the differential equation $\left(1 + \left(\frac{dy}{dx}\right)^3\right)^{\frac{7}{3}} = 7 \frac{d^2y}{dx^2}$ respectively are 3 and 2.

Statement-II : If $x^3dy + xydx = x^2dy + 2ydx$, $y(2) = e$, then $y(-1) = \frac{4}{e}$.

- (A) Both Statement-I and Statement-II are true.
 (B) Both Statement-I and Statement-II are false.
 (C) Statement-I is true but Statement-II is false.
 (D) Statement-I is false but Statement-II is true.

10. Solve the following and select the correct option.

(i) If the function $f(x) = 2x^2 - kx + 5$ is increasing on $[1, 2]$, then k lies in the interval

(ii) The interval in which the function $y = x^3 + 5x^2 - 1$ is decreasing, is

(i)

(ii)

(A) $(-\infty, 4)$

(0, 10)

(B) $(4, \infty)$

$\left(\frac{-10}{3}, 0\right)$

(C) $(-\infty, 4)$

$\left(\frac{-10}{3}, 0\right)$

(D) None of these

ANSWER KEY

1. (C) 2. (C) 3. (B)

MATHEMATICAL REASONING 4. (A) 5. (C) 6. (B)

APPLIED MATHEMATICS 4. (D) 5. (B) 6. (A)

7. (D) 8. (D) 9. (C) 10. (C)