1

MOCK TEST PAPER

Instructions

1. ***Section A will have 15 Questions covering both i.e., Mathematics/Applied Mathematics which will be compulsory for all candidates.***
2. ***Section B1 will have 35 Questions from Mathematics out of which 25 Questions need to be attempted. Section B2 will have 35 Questions purely from applied mathematics out of which 25 Questions will be attempted.***
3. ***Marking Scheme of the test.***
   - **a.** ***Correct answer or the most appropriate answer: Five marks (+5)***
   - **b.** ***Any incorrect option marked will be given minus one mark (–1)***
   - **c.** ***Unanswered/marked for review will be given no mark (0)***

Full Marks: 200 ***(Time: 60 Minutes)***

SECTION-A (MATHEMATICS/APPLIED MATHEMATICS)

1. Let X be the random variable, P(X = x) is the Probability mass function is given by

X	0	1	2	3
P(X = x)	0	k	2k	3k

Determine the value of k?

(*a*) $\frac{1}{5}$ (*b*) $\frac{2}{5}$ (*c*) $\frac{1}{6}$ (*d*) $\frac{1}{2}$

2. The variance of data : 0, 10, 20, 30, 40, 50

(*a*) 291.67 (*b*) 290 (*c*) 230 (*d*) 12

3. Consider the given problem:

$5x + y \le 100$ ... (i)

$x + y \le 60$ ... (ii)

$x \ge 0$ ... (iii)

$y \ge 0$ ... (iv)

Which point will not form the boundary of the feasible region?

(*a*) (60, 0) (*b*) (20, 0) (*c*) (0, 60) (*d*) (10, 50)

4. Match the List-I with List-II.

	List-I (Differential Equation)		**List-II (Order and Degree)**
A.	$\left(\frac{d^2y}{dx^2}\right)^{2/3} + 4 - \frac{3dy}{dx} = 0$	(i)	3, 2
B.	$\frac{1}{3}\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \frac{dy}{dx} = 0$	(ii)	2, 2
C.	$\sqrt{1+\left(\frac{dy}{dx}\right)^3} = \left(\frac{d^3y}{dx^3}\right)^{1/3}$	(iii)	4, 4
D.	$\frac{d^4y}{dx^4} = \left[1+\left(\frac{d^3y}{dx^3}\right)^2\right]^{1/4}$	(iv)	2, 3

Match the correct answer from the options given below:

(*a*) A-(iv), B-(i), C-(ii), D-(iii)

(*b*) A-(iii), B-(iv), C-(i), D-(ii)

(*c*) A-(iv), B-(ii), C-(i), D-(iii)

(*d*) A-(ii), B-(iv), C-(i), D-(iii)

5. $\int \frac{e^x}{(1+e^x)(2+e^x)}dx =$

(*a*) $\log|(1+e^x)(2+e^x)| + c$

(*b*) $\log\left|\frac{1+e^x}{2+e^x}\right| + c$

(*c*) $\log\left|(1+e^x)\sqrt{2+e^x}\right| + c$

(*d*) None of these

6. Compute $\int\left(\cos(x) - \frac{3}{x^4}\right)dx.$

(*a*) $\sin(x) + \frac{3}{4}x^{-7} + c$ (*b*) $\sec(x) + \frac{3}{4}x^{-3} + c$

(*c*) $\sin(x) + \frac{3}{4}x^{-3} + c$ (*d*) $\sin(x) + x^{-3} + c$

7. Integrate $\int_0^2 (x^2 + x + 1)dx$

(*a*) $\frac{15}{2}$ (*b*) $\frac{20}{5}$ (*c*) $\frac{20}{3}$ (*d*) $\frac{3}{20}$

8. If $f(x) = kx^3 - 9x^2 + 9x + 3$ is monotonically increasing in each interval, then

(a) $k < 3$ (b) $k \le 3$

(c) $k > 3$ (d) None of these

9. The function $f(x) = \begin{cases} x, & \text{if } 0 \le x \le 1 \\ 1, & \text{if } 1 < x \le 2 \end{cases}$ is

(a) Continuous at all x, $0 \le x \le 2$ and differentiable at all x, except $x = 1$ in the interval $[0, 2]$

(b) Continuous and differentiable at all x in $[0, 2]$

(c) Not continuous at any point in $[0, 2]$

(d) Not differentiable at any point $[0, 2]$

10. If $y = 4x - 5$ is tangent to the curve $y^2 = px^3 + q$ at (2, 3), then

(a) $p = 2, q = -7$ (b) $p = -2, q = 7$

(c) $p = -2, q = -7$ (d) $p = 2, q = 7$

11. If $f(x) = x + \cot x$, find $f''\left(\frac{\pi}{4}\right)$

(a) -4 (b) 2 (c) 4 (d) -2

12. If $\begin{bmatrix} xy & 4 \\ z+5 & x+y \end{bmatrix} = \begin{bmatrix} 4 & w \\ 0 & 4 \end{bmatrix}$ then value of y is

(a) 4 (b) 8 (c) 6 (d) 2

13. If $A = \begin{bmatrix} 2 & 3 \\ 1 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix}$, then find $(AB)^{-1}$.

(a) $\frac{1}{11}\begin{bmatrix} 17 & 5 \\ 5 & 1 \end{bmatrix}$ (b) $\frac{1}{11}\begin{bmatrix} 14 & 5 \\ 5 & 1 \end{bmatrix}$

(c) $\frac{1}{11}\begin{bmatrix} 1 & 5 \\ 5 & 14 \end{bmatrix}$ (d) $\frac{1}{11}\begin{bmatrix} 1 & -5 \\ -5 & 14 \end{bmatrix}$

14. The value of determinant $\begin{vmatrix} 1 & a & b+c \\ 1 & b & c+a \\ 1 & c & a+b \end{vmatrix}$

(a) 0 (b) 1 (c) $a + b + c$ (d) 3

15. The function $f: R \to R$ defined by $f(x) = 2^x + 2^{|x|}$ is

(a) one-one and onto (b) many-one and onto

(c) one-one and into (d) many-one and into

SECTION-B1 (MATHEMATICS)

16. If $4\tan^{-1} x + \cot^{-1} x = \pi$, then x equals:

(a) 1 (b) -1 (c) $\sqrt{3}$ (d) $\frac{1}{\sqrt{3}}$

17. Match Column-I with Column-II.

Column-I		Column-II	
A.	$f: R \to R$ defined by $f(x) = ax + b$ is	(i)	injection but not surjection
B.	$f: R \to [0, \infty)$ defined by $f(x) = \lvert x \rvert$ is	(ii)	surjection but not injection
C.	$f: R \to R$ defined by $f(x) = [x]$ is	(iii)	bijection
D.	$f: N \to N$ defined by $f(x) = x^3$ is	(iv)	neither injection nor surjection

Choose the correct answer from the options given below:

(a) A-(ii), B-(iv), C-(i), D-(iii)

(b) A-(ii), B-(iv), C-(iii), D-(i)

(c) A-(iii), B-(ii), C-(iv), D-(i)

(d) A-(iii), B-(ii), C-(i), D-(iv)

18. Principal value of $\sin^{-1}\left(-1/\sqrt{2}\right)$ is _____

(a) $-\frac{\pi}{6}$ (b) $-\frac{\pi}{4}$ (c) $-\frac{\pi}{2}$ (d) $-\frac{5\pi}{3}$

19. Let $f: R \to R$ be a function 'f' be defined by $f(x) = 5x^2 + 2 \ \forall \ x \in R$, then 'f' is

(a) Onto function (b) One-one, onto function

(c) One-one, into function (d) Many-one into function

20. If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if $xy = 1$, then $\det(AA^T)$ is equal to

(a) $(a-1)^2$ (b) $(a^2+1)^2$ (c) $a^2 - 1$ (d) $(a^2-1)^2$

21. If A is an invertible matrix of order 2, then $\det(A^{-1})$ is equal to

(a) det (A) (b) 1/det (A) (c) 1 (d) 0

22. The value of determinant

$$\begin{vmatrix} a-b & b+c & a \\ b-c & c+a & b \\ c-a & a+b & c \end{vmatrix}$$

(a) $a^3 + b^3 + c^3$ (b) 3bc

(c) $a^3 + b^3 + c^3 - 3abc$ (d) None of these

23. System of equations AX = B is inconsistent if

(a) $|B| = 0$ (b) $|\text{adj } A|B = 0$

(c) $(\text{adj } A)B \ne 0$ (d) $|A| \ne 0$

24. For the function $f(x) = x + \frac{1}{x}$, $x \in [1, 3]$ the value of c for mean value theorem is

(a) 1 (b) $\sqrt{3}$ (c) 2 (d) None

25. Differentiate the function $\cos[\cos(\log 7x)]$.

(a) $\sin\left[\cos(\log 7x)\right]\sin(\log 7x)\frac{1}{x}$

(b) $\cos\left[\sin(\log 7x)\right]\cos(\log 7x)\frac{1}{x}$

(c) $-\sin\left[\cos(\log 7x)\right]\sin(\log 7x)\frac{1}{x}$

(d) None

26. Let $g(x)=\begin{cases}-x, & x\le 1\\ x+1, & x\ge 1\end{cases}$ and $f(x)=\begin{cases}1-x, & x\le 0\\ x^2, & x>0\end{cases}$

Consider the composition of f and g, i.e. (fog)(x) = f(g(x)). The number of discontinuities in (fog)(x) present in the interval $(-\infty, 0)$ is:

(*a*) 0 (*b*) 1 (*c*) 2 (*d*) 4

27. For the given curve: $y = 2x - x^2$, when x increases at the rate of 3 units/sec, then how the slope of curve changes?

(*a*) Increasing, at 6 units/sec (*b*) Decreasing, at 6 units/sec

(*c*) Increasing, at 3 units/sec (*d*) Decreasing, at 3 units/sec

28. $f(x)=\begin{cases}-x^2, & \text{for } x<0\\ x^2+8, & \text{for } x\ge 0\end{cases}$

Let. Then x-intercept of the line, that is, the tangent to the graph of f(x) is

(*a*) Zero (*b*) –1 (*c*) –2 (*d*) –4

29. The sides of an equilateral triangle are increasing at the rate of 2cm/sec. The rate at which the are increases, when side is 10 cm is

(*a*) 10 cm^2/s (*b*) $\sqrt{3}$ cm^2/s

(*c*) $10\sqrt{3}$ cm^2/s (*d*) $\frac{10}{3}$ cm^2/s

30. $\int\sqrt{x^2+2x+5}\,dx$

(*a*) $\frac{1}{2}(x+1)\sqrt{x^2+2x+5}+2\log\left|x+1+\sqrt{x^2+2x+5}\right|+C$

(*b*) $(x+1)\sqrt{x^2+2x+5}+\frac{1}{2}\log\left|x+1+\sqrt{x^2+2x+5}\right|+C$

(*c*) $(x+1)\sqrt{x^2+2x+5}+2\log\left|x+1+\sqrt{x^2+2x+5}\right|+C$

(*d*) $(x+1)\sqrt{x^2+2x+5}-2\log\left|x+1+\sqrt{x^2+2x+5}\right|+C$

31. Match the integrals of f(x) if

List-I		List-II	
A.	$f(x)=\frac{1}{(x^2+1)\sqrt{x^2+2}}$	(i)	$\frac{x^5}{5(1-x^4)^{5/2}}+c$
B.	$f(x)=\frac{1}{(x+2)\sqrt{x^2+6x+7}}$	(ii)	$\sin^{-1}\left(\frac{x+1}{(x+2)\sqrt{2}}\right)+c$
C.	$f(x)=\frac{x^4+x^8}{(1-x^4)^{7/2}}$	(iii)	$-2\sqrt{1-x}+\cos^{-1}\sqrt{x}+\sqrt{x}\sqrt{1-x}+c$
D.	$f(x)=\sqrt{\frac{1-\sqrt{x}}{1+\sqrt{x}}}$	(iv)	$-\tan^{-1}\sqrt{1+(2/x^2)}+c$

Match the correct answer from the options given below:

(*a*) A-(iv), B-(i), C-(ii), D-(iii) (*b*) A-(iii), B-(iv), C-(i), D-(ii)

(*c*) A-(iv), B-(ii), C-(i), D-(iii) (*d*) A-(ii), B-(iv), C-(i), D-(iii)

32. The area of the region bounded by the line y – 1 = x, the x-axis and the ordinates x = –2 and x = 3 is

(*a*) 17 sq. units (*b*) 12 sq. units

(*c*) 11 sq. units (*d*) $\frac{17}{2}$ sq. units

33. What is the general solution of the differential equation $x^2\,dy + y^2\,dx = 0$? Where c is the constant of integration

(*a*) x + y = c (*b*) xy = c

(*c*) c(x + y) = xy (*d*) None of the above

34. If $|\vec{a}|=3, |\vec{b}|=4$ and $|\vec{a}+\vec{b}|=5$, then what is the value of $|\vec{a}-\vec{b}|$?

(*a*) 8 (*b*) 6 (*c*) $5\sqrt{2}$ (*d*) 5

35. What is the value of p for which the vector $p(2\hat{i}-\hat{j}+2\hat{k})$ is of 3 units length?

(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 6

36. If the direction consines of a line are $\left(\frac{1}{k},\frac{2}{k},\frac{-2}{k}\right)$ then k is

(*a*) $\pm\left(\frac{1}{\sqrt{3}}\right)$ (*b*) $\frac{1}{3}$ (*c*) $\pm\sqrt{3}$ (*d*) ± 3

37. Distance of plane $\vec{r}\cdot(-2\hat{i}+3\hat{j}+6\hat{k})-2=0$, from origin is

(*a*) 2 (*b*) 14 (*c*) $\frac{2}{7}$ (*d*) $-\frac{2}{7}$

38. The sine of the angle between the straight line $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ and the plane 2x – 2y + z = 5 is

(*a*) $\frac{10}{6\sqrt{5}}$ (*b*) $\frac{4}{5\sqrt{2}}$ (*c*) $\frac{2\sqrt{3}}{5}$ (*d*) $\frac{\sqrt{2}}{10}$

39. Maximize Z = 3x + 4y subject to the constraints: $x + y \le 4$, $x \ge 0, y \ge 0$.

(*a*) 16 (*b*) 12 (*c*) 15 (*d*) 17

40. If $f(x)=\frac{1}{2}e^{2x}+\frac{1}{8}x^2$, $f'(x)=ae^{bx}+\frac{1}{4}x$, then the value of a and b is

(*a*) a = 1, b = 2 (*b*) a = 2, b = 2

(*c*) $a=\frac{1}{2}, b=2$ (*d*) a = 0, b = 1

41. Match column-I with column-II.

Column-I		Column-II	
A.	If P(A) = 0.4, P(B) = 0.8 $P\left(\frac{B}{A}\right)=0.6$, find $P(A\cap B)=?$	(i)	0.24
B.	One card is drawn from a pack of 52 cards. Find the probability of chosen card is not a black card	(ii)	$\frac{1}{2}$

C.	If $P(A)=\frac{2}{3}, P(B)=\frac{4}{9}$, $P(A\cap B)=\frac{14}{15}$, then $P(A'\cap B')$	(iii)	$\frac{1}{4}$
D.	If $P(A)=\frac{1}{2}, P(B)=\frac{1}{4}$ and $P(A\cap B)=\frac{1}{5}$, then $P\left(\frac{\overline{B}}{\overline{A}}\right)$	(iv)	$\frac{9}{20}$

Choose the correct answer from the options given below:

(*a*) A-(ii), B-(i), C-(iii), D-(iv)

(*b*) A-(i), B-(iii), C-(ii), D-(iv)

(*c*) A-(i), B-(ii), C-(iv), D-(iii)

(*d*) A-(i), B-(ii), C-(iii), D-(iv)

42. If $f(x)=\frac{3x+3}{5x-3}$, then consider the following properties:

A. The inverse of f(x) satisfies $f^{-1}(x) = f(x)$

B. The composition (fof)(x) = –x.

C. $f^{-1}(x) = -f(x)$

D. The derivative of $f^{-1}(x)$ is proportional to f(x) with a factor of $-\frac{1}{19}$.

Choose the correct answer from the options given below:

(*a*) (A), (B), and (C) are correct

(*b*) (B) and (D) are correct

(*c*) (A), (B), and (D) are correct

(*d*) (B), (C), and (D) are correct

43. The smallest and the largest values of $\tan^{-1}\left(\frac{1-x}{1+x}\right)$, $0 \le x \le 1$ are

A. The smallest value is 0.

B. The largest value is $\frac{\pi}{4}$.

C. The largest value is $\frac{\pi}{2}$.

D. The smallest value is $-\frac{\pi}{4}$.

Choose the correct answer from the options given below:

(*a*) (A), (B) only (*b*) (A), (C) only

(*c*) (B), (D) only (*d*) (A), (D) only

44. If matrices $A=\begin{bmatrix}2 & -1 & 3\\ -4 & 5 & 1\end{bmatrix}, B=\begin{bmatrix}2 & 3\\ 4 & -2\\ 1 & 5\end{bmatrix}$, and $C=\begin{bmatrix}1 & 2 & 3 & 4\\ 5 & 6 & 7 & 8\end{bmatrix}$ are given, which of the following is correct regarding matrix multiplication?

(A) AB & BA are defined.

(B) Both AB and BC are defined, but BA is not defined.

(C) AB & AC are defined, but BA is not defined.

(D) AB, BA and BC are defined, but AC is not defined.

Choose the correct answer from the options given below:

(*a*) (A), (B) only

(*b*) (A), (D) only

(*c*) (A), (C), and (D) only

(*d*) (A), (B), and (C) only

45. The function $f(x) = 4\sin^3 x - 6\sin^2 x + 12\sin x + 100$ is strictly

(A) Increasing in $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ (B) Increasing in $\left(\frac{\pi}{2},\pi\right)$

(C) Decreasing in $\left(-\frac{\pi}{2},\frac{\pi}{2}\right)$ (D) Decreasing in $\left(\frac{\pi}{2},\pi\right)$

Choose the correct answer from the options given below.

(*a*) (B) and (C) only (*b*) (A) and (C) only

(*c*) (B) and (D) only (*d*) (A) and (D only

46. Match Column-I with Column-II.

Column-I		Column-II	
A.	The function $f(x) = e^x$ is always	(i)	1, –1
B.	Function $y = x^2 - 4x$ give maxima at	(ii)	Increasing
C.	Maximum value of $\left(\frac{1}{x}\right)^x$ is $b.(e)^{1/e}$ than find value of b.	(iii)	x = 2
D.	Critical points for $f(x) = x+\frac{1}{x}$	(iv)	1

Choose the correct answer from the options given below:

(*a*) A-(ii), B-(iii), C-(iv), D-(i)

(*b*) A-(i), B-(iii), C-(iv), D-(ii)

(*c*) A-(iii), B-(ii), C-(iv), D-(i)

(*d*) A-(iv), B-(ii), C-(iii), D-(i)

47. Consider the differential equation, $\frac{dy}{dx}+y=e^{-x}$, $y(0) = 0$

Using the method of integrating factors, determine the correct solution from the following.

A. The integrating factor (*I*.F.) is e^{-x}.

B. The integrating factor (*I*.F.) is e^{-x}.

C. The solution is $y = xe^{-x}$.

D. The solution is $y = -xe^{-x}$.

Choose the correct answer from the options given below

(*a*) (A), (C) only (*b*) (B), (C) only

(*c*) (A), (D) only (*d*) (B), (D) only

48. Given the vectors, $\vec{a} = 2\hat{i} + \hat{j} + 2\hat{k}, \vec{b} = 5\hat{i} - 3\hat{j} + \hat{k}$

(A) $\vec{a} \cdot \vec{b} = 9$

(B) $|\vec{a}| = 9$

(C) The projection of $\vec{b}$ on $\vec{a}$ is 3.

(D) The projection of $\vec{b}$ on $\vec{a}$ is 4.

Choose the correct answer from the options given below

(*a*) (A), (C) only (*b*) (A), (B), and (C) only

(*c*) (A), (D) only (*d*) (B), (C) only

49. The shortest distance between the lines

$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$

which can be written as, $\vec{r}_1 = \vec{a}_1 + \lambda\vec{b}_1$ and $\vec{r}_2 = \vec{a}_2 + \mu\vec{b}_2$ is determined using the vector approach. Consider the following statements:

(A) $\vec{a}_1 - \vec{a}_2 = 6\hat{i} + 15\hat{j} - 3\hat{k}$

(B) The magnitude of $\vec{b}_1 \times \vec{b}_2$ is $3\sqrt{30}$.

(C) The shortest distance is $\sqrt{30}$.

(D) The shortest distance is $3\sqrt{30}$.

Choose the correct answer from the options given below:

(*a*) (A), (C) only

(*b*) (A), (B), (C) only

(*c*) (A), (D) only

(*d*) (A), (B), (D) only

50. Consider the differential equation, $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right) + x^{1/5} = 0$

Let the order of the equation be p and the degree of the equation be q. Based on this, which of the following is correct?

(A) The order of the equation, p = 2

(B) The degree of the equation, q = 4

(C) p + q = 3

(D) p – q = –2

Choose the correct answer from the options given below:

(*a*) (A), (B) only

(*b*) (A), (C) only

(*c*) (A), (B), and (D) only

(*d*) (A), (B), (C), and (D)

SECTION-B2 (APPLIED MATHEMATICS)

16. The price of three commodities are shown in the following table:

Commodity	Price 2020	Price 2021
A	₹ 4	₹ 5
B	₹ 60	₹ 57
C	₹ 36	₹ 42

The price index for 2021 taking 2020 as base year using simple aggregative method is

(*a*) 103 (*b*) 104 (*c*) 105 (*d*) 106

17. The measurable characteristic of population is called

(*a*) Parameter (*b*) Statistic

(*c*) Sample (*d*) None of these

18. If $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then F(x) F(y) is equal to

(*a*) F(x – y) (*b*) F(x + y)

(*c*) F(2x + y) (*d*) None of these

19. The present value of a sequence of payments of ₹ 800 made at the end of every 6 month and continuing forever, if money is worth 4% p.a. compounded semi-annually, is

(*a*) ₹ 20000 (*b*) ₹ 40000 (*c*) ₹ 60000 (*d*) ₹ 80000

20. Given that $\Sigma p_0q_0 = 700$, $\Sigma p_0q_1 = 1450$, $\Sigma p_1q_0 = 855$ and $\Sigma p_1q_1 = 1300$, where subscripts 0 and 1 are used for base year and current year respectively. The Paasche's index number is

(*a*) 92.68 (*b*) 91.36 (*c*) 89.66 (*d*) 88.72

21. If $A = \begin{bmatrix} 0 & -3 & 2 \\ a+2 & 0 & 3 \\ -2 & b-3 & 0 \end{bmatrix}$ is a skew symmetric matrix, then the values of a and b is equal to

(*a*) 1, 3 (*b*) 0, 1 (*c*) 1, 0 (*d*) 2, 0

22. The Central Limit Theorem States that the sampling distribution of sample mean approaches a normal distribution if

(*a*) All possible samples are selected

(*b*) Sample size is large

(*c*) Sample size is small

(*d*) None of these

23. At what rate of interest will the present value of a perpetuity of ₹ 500 payable at the end of each quarter be ₹ 40000?

(*a*) 1.25% (*b*) 2.5% p.a. (*c*) 5% p.a. (*d*) 6% p.a.

24. The value of x, y, a, and b if

$$\begin{bmatrix} 3x+4y & 6 & x-2y \\ a+b & 2a-b & -3 \end{bmatrix} = \begin{bmatrix} 2 & 6 & 4 \\ 5 & -5 & -3 \end{bmatrix}$$

(*a*) x = 2, y = 1, a = –1, b = 5 (*b*) x = 2, y = –1, a = 0, b = 5

(*c*) x = –1, y = 2, a = 5, b = 0 (*d*) None of these

25. The wholesale price index (or price relative) of rice in 2012 compared to 2010 is 130. If the cost of rice was ₹ 12 per kg in 2010, then cost of rice in 2012 is

(*a*) ₹ 16 per kg (*b*) ₹ 15.60 pe kg

(*c*) ₹ 14.80 per kg (*d*) ₹ 16.90 per kg

26. Which sample size is considered to be sufficient to hold Central Limit Theorem?

(*a*) Sample size of 30 or more (*b*) Sample size of 20 or more

(*c*) Sample size of 30 or less (*d*) Sample size of 20 or less

27. If the sum of the matrices [x x y], [y y z] and [z 0 0] is the matrix [10 5 5], then what is the value of y?

(*a*) –5 (*b*) 0 (*c*) 5 (*d*) 10

28. A bond of face value ₹ 500 matures in 3 years, interest is paid semi-annually and bond is priced to yield 10% p.a. If the present value of bond is ₹ 450, the annual coupon rate is

(*a*) Less than 10% (*b*) More than 10%

(*c*) Equal to 10% (*d*) None of these

29. To find the Paasche's index number, we use the formula

(*a*) $\frac{\Sigma p_1 q_1}{\Sigma p_0 q_0} \times 100$ (*b*) $\frac{\Sigma p_0 q_0}{\Sigma p_1 q_1} \times 100$

(*c*) $\frac{\Sigma p_1 q_0}{\Sigma p_0 q_0} \times 100$ (*d*) $\frac{\Sigma p_1 q_1}{\Sigma p_0 q_1} \times 100$

30. If $y = 5\cos x - 3\sin x$, then $\frac{d^2y}{dx^2}$ is equal to:

(*a*) –y (*b*) y (*c*) 25y (*d*) 9y

31. Find the expected value of a random variable which has the following probability distribution.

x	2	4	6	8	10
P	0.1	0.3	0.4	0.1	0.1

(*a*) 5.2 (*b*) 5.4 (*c*) 5.6 (*d*) 5.8

32. Find the second order derivative if $y = e^{2x^2}$.

(*a*) $4e^{2x^2}\left(4x^2+3\right)$ (*b*) $4e^{2x^2}\left(4x^2-1\right)$

(*c*) $4e^{2x^2}\left(4x^2+1\right)$ (*d*) $4^{2x^2}\left(4x^2+1\right)$

33. The mean and the variance in a binomial distribution are found to be 2 and 1 respectively. The probability P(X = 0) is

(*a*) $\frac{1}{2}$ (*b*) $\frac{1}{4}$ (*c*) $\frac{1}{8}$ (*d*) $\frac{1}{16}$

34. Match Column-I with Column-II.

Column-I		Column-II	
A.	R on set A = {0, 1, 2, 3, 4, 5} given by R = {(a, b): 2 divides (a – b)} write equivalence class [0]	(i)	{(1, 3), (2, 4)}
B.	If A = {1, 2, 3, ..., 9} and R is the relations A × A defined by (a, b) R (c, d), if a + d = b + c for (a, b), (c, d) in A × A. write equivalence class [(2, 5)]	(ii)	{(1, 4) (2, 5), (3, 6), (4, 7), (5, 8), (6, 9)}
C.	Relations S defined on set A = {1, 2, 3, 4} by (a, b) S (c, d) ⇒ a + d = b + c. Write equivalence class [(1, 3)]	(iii)	{1, 3, 5} {2, 4}
D.	Relation R in set A = {1, 2, 3, 4, 5} given R = {(a, b) : |a – b| is divisible by 2}. Write all the equivalence classes of R	(iv)	{0, 2, 4}

Choose the correct answer from the options given below:

(*a*) A-(ii), B-(i), C-(iii), D-(iv) (*b*) A-(iv), B-(i), C-(ii), D-(iii)

(*c*) A-(iv), B-(ii), C-(iii), D-(i) (*d*) A-(iv), B-(ii), C-(i), D-(iii)

35. The function $f(x) = 12x^3 - 3x^2 - 12x + 4$ has

(A) One local maximum and one local minimum.

(B) Points of local maximum and minimum are x = –1 and x = 2 respectively.

(C) Points of local maximum and minimum are x = 1 and x = –2 respectively.

(D) No local maximum or minimum exists.

Choose the correct answer from the options given below.

(a) (A), (B) only (b) (A), (C) and (D)

(c) (B), (D) only (d) (A), (B), and (C)

36. Match Column-I with Column-II.

Column-I		Column-II	
A.	$(\cos^{-1}x)^2 + (\cos^{-1}y)^2 = 2\pi^2$, then $x^5 + y^5 =$	(i)	1
B.	$(\sin^{-1}x)^2\ (\cos^{-1}y)^2 = \frac{\pi^4}{4}$, then, $\|x - y\| =$	(ii)	–2
C.	$(\sin^{-1}x)^2 + (\sin^{-1}y)^2 = \frac{\pi^2}{2}$ then, $x^3 + y^3 =$	(iii)	0
D.	$\|\sin^{-1}x - \sin^{-1}y\| = \pi$, then, $x^y =$	(iv)	2

Choose the correct answer from the options given below:

(*a*) A-(ii); B-(iii), (iv); C-(ii), (iii), (iv); D-(i)

(*b*) A-(ii); B-(ii), (iii); C-(ii), (i), (iii); D-(i)

(*c*) A-(iii); B-(i), (ii); C-(iv), (i); D-(ii)

(*d*) A-(iv); B-(ii), (iii); C-(i), (iii); D-(iii)

37. If the system of equations $2x - 3y + 5z = 12$, $3x + y + \lambda z = \mu$, $x - 7y + 8z = 17$ has infinitely many real solutions, which of the following is correct?

(A) $\lambda = 2, \mu = 7$ (B) $\lambda = 3, \mu = 4$

(C) $\lambda + \mu = 9$ (D) $\lambda + \mu = 7$

Choose the correct answer from the options given below.

(*a*) (A), (C) only (*b*) (D) only

(*c*) (B), (C) only (*d*) (C) only

38. If A and B are two square matrices such that AB = I (where I is the identity matrix), which of the following is/are true?

(A) BA = I (B) $B^{-1} = A$ (C) $A^{-1} = B$ (D) $A^2 = B$

Choose the correct answer from the options given below.

(*a*) (A), (B) only (*b*) (A), (B), (C) only

(*c*) (B), (C), (D) only (*d*) (A), (B), (C), and (D)

39. If $x = 7t^2 + 5$ and $y = 2t - 9$, then $\frac{dy}{dx} =$

(*a*) 7t (*b*) 2t (*c*) $\frac{1}{7t}$ (*d*) 7

40. An insurance company has found that 50% of its claims are for damages resulting from accidents. The probability that a random sample of 10 claims will contain fewer than 2 for accidents is

(*a*) $\frac{1}{1024}$ (*b*) $\frac{5}{512}$ (*c*) $\frac{11}{1024}$ (*d*) $\frac{15}{1024}$

41. The x-coordinates of critical points of $f(x) = \frac{x+3}{x^2+3x+2}$.

(*a*) $3-\sqrt{2}$ (*b*) $-3-\sqrt{2}$

(*c*) –1 and –2 (*d*) None of these

42. The expected value of a random variable is its _____

(*a*) Mean (*b*) Standard Deviation

(*c*) Mean Deviation (*d*) Variance

43. Find the least non-negative remainder when 23 × 73 is divided by 8.

(*a*) 7 (*b*) 4 (*c*) 5 (*d*) 3

44. In a mixture of 246 liters, the ratio of acid to water is 2 : 1. Another 10 liters of water is added to the mixture. The ratio of acid to water in the new mixture is:

(*a*) 23 : 22 (*b*) 41 : 23 (*c*) 23 : 41 (*d*) 71 : 23

45. Find (18 + 37) mod 4.

(*a*) 3 mod 4 (*b*) 5 mod 4 (*c*) 0 mod 4 (*d*) None

46. The price and quantities of certain commodities are shown in the following table:

	A	B
p_0	1	1
q_0	10	5
p_1	2	x
q_1	5	2

If ratio of Laspeyres (L) and Paasches (P) index number i.e., L : P = 28 : 27, then the value of x is

(*a*) 2 (*b*) 5 (*c*) 4 (*d*) 5

47. For a race a distance of 224 metres can be covered by P in 28 second and Q in 32 seconds. By what distance does P defeat Q eventually?

(*a*) 26 m (*b*) 32 m (*c*) 24 m (*d*) 28 m

48. The derivative of the following function:

$f(x) = \frac{5x^2}{x+47}$

(*a*) $f'(x) = \frac{5x^2 - 470x}{(x+47)^2}$ (*b*) $f'(x) = \frac{10x^2 + 470x}{(x+47)}$

(*c*) $f'(x) = 10x$ (*d*) None of these

49. Laspeyre's index = 110, Paasche's index = 108, then Fisher's ideal index is equal to:

(*a*) 110 (*b*) 108 (*c*) 100 (*d*) 109

50. How much tea at Rs. 4 per kg should be added to 15 kg of tea at Rs. 10 pr kg, so that mixture be worth Rs. 6.50 per kg?

(*a*) 20 kg (*b*) 21 kg (*c*) 15 kg (*d*) 25 kg

Answer Key

(Scan QR Code for Detailed Explanations)

Section-A

1. (*c*)	**2.** (*a*)	**3.** (*a*)	**4.** (d)	**5.** (*b*)	**6.** (*d*)	**7.** (*c*)	**8.** (*c*)	**9.** (*a*)	**10.** (*a*)
11. (*c*)	**12.** (*d*)	**13.** (*b*)	**14.** (*a*)	**15.** (*c*)					

Section-B1

16. (*d*)	**17.** (*c*)	**18.** (*b*)	**19.** (*b*)	**20.** (*d*)	**21.** (*b*)	**22.** (*c*)	**23.** (*c*)	**24.** (*b*)	**25.** (*a*)
26. (*a*)	**27.** (*b*)	**28.** (*b*)	**29.** (*c*)	**30.** (*a*)	**31.** (*c*)	**32.** (*d*)	**33.** (*c*)	**34.** (*d*)	**35.** (*a*)
36. (*d*)	**37.** (*c*)	**38.** (*d*)	**39.** (*a*)	**40.** (*a*)	**41.** (*d*)	**42.** (*b*)	**43.** (*a*)	**44.** (*b*)	**45.** (*d*)
46. (*a*)	**47.** (*a*)	**48.** (*a*)	**49.** (*d*)	**50.** (*c*)					

Section-B2

16. (*b*)	**17.** (*b*)	**18.** (*b*)	**19.** (*b*)	**20.** (*c*)	**21.** (*c*)	**22.** (*b*)	**23.** (*c*)	**24.** (*b*)	**25.** (*b*)
26. (*a*)	**27.** (*b*)	**28.** (*a*)	**29.** (*d*)	**30.** (*a*)	**31.** (*c*)	**32.** (*c*)	**33.** (*d*)	**34.** (*d*)	**35.** (*a*)
36. (*a*)	**37.** (*a*)	**38.** (*b*)	**39.** (*c*)	**40.** (*c*)	**41.** (*b*)	**42.** (*a*)	**43.** (*a*)	**44.** (*b*)	**45.** (*a*)
46. (*c*)	**47.** (*b*)	**48.** (*d*)	**49.** (*d*)	**50.** (*b*)					