Test / Exam Name: MCQS PREVIOUSLY ASKED	Standard: 12TH SCIENCE	Subject: MATHEMATICS
Student Name: ------------------------	Section: -----------------------	Roll No.: ------------------------

Questions: 240 | Time: 60 Mins | Marks: 240

Q1. The integrating factor of the differential equation $(1 - x^2)\dfrac{dy}{dx} + xy = ax, -1 < x < 1$, is: — **1 Marks**

A. $\dfrac{1}{x^2-1}$

B. $\dfrac{1}{\sqrt{x^2-1}}$

C. $\dfrac{1}{1-x^2}$

D. $\dfrac{1}{\sqrt{1-x^2}}$

Q2. Write the order and the degree of the following differential equation: — **1 Marks**

$$x^3\left(\dfrac{d^2y}{dx^2}\right)^2 + x\left(\dfrac{dy}{dx}\right)^4 = 0$$

Q3. A is a square matrix of order 3 and $|A| = 7$. Write the value of $|$ adj. A $|$. — **1 Marks**

Q4. Find the scalar components of the vector $\overrightarrow{AB}$ with initial point A(2, 1) and terminal point B(- 5, 7). — **1 Marks**

Q5. The value of $(\hat{i} \times \hat{j}) \cdot \hat{j} + (\hat{j} \times \hat{i}) \cdot \hat{k}$ is: — **1 Marks**

A. 2   B. 0   C. 1   D. -1

Q6. Two cards are drawn at random and one-by-one without replacement from a well-shuffled pack of 52 playing cards. Find the probability that one card is red and the other is black. — **1 Marks**

Q7. Evalute: — **1 Marks**

$$\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} x\cos^2 x\,dx.$$

Q8. if A is a 3×3 matrix and $|3A| = K|A|$, then write the value of k. — **1 Marks**

Q9. The principal value of $\tan^{-1}\left(\tan\dfrac{3\pi}{5}\right)$ is: — **1 Marks**

A. $\dfrac{2\pi}{5}$

B. $\dfrac{-2\pi}{5}$

C. $\dfrac{3\pi}{5}$

D. $\dfrac{-3\pi}{5}$

Q10. Evaluate: — **1 Marks**

$$\int_0^2 \sqrt{4-x^2}\,dx.$$

Q11. Find the differential equation representing the family of curves y = −A cos 3x + B sin 3x. — **1 Marks**

Q12. Evaluate: — **1 Marks**

$$\begin{vmatrix} \sin 30^O & \cos 30^O \\ -\sin 60^O & \cos 60^O \end{vmatrix}$$

.

Q13. The Victors $3\hat{i} - \hat{j} + 2\hat{k}$, $2\hat{i} - \hat{j} + 3\hat{k}$ and $\hat{i} + \lambda\hat{j} - \hat{k}$ are coplanar if value of λ is: **1 Marks**

    A. - 2   B. 0   C. 2   D. Any real number

Q14. Let * be a 'binary' operation on N given by a * b = LCM (a, b) for all a, b $\in$ N. Find 5 * 7. **1 Marks**

Q15. Write the antiderivative of **1 Marks**
$\left(3\sqrt{x} + \dfrac{1}{\sqrt{x}}\right)$.

Q16. If Vectors $\vec{a}$ and $\vec{b}$ are such that $|\vec{a}| = \dfrac{1}{2}, |\vec{b}| = \dfrac{4}{\sqrt{3}}$ and $|\vec{a} \times \vec{b}| = \dfrac{1}{\sqrt{3}}$, then **1 Marks**
find $|\vec{a}.\vec{b}|$.

Q17. **1 Marks**
Given a skew-symmetric matrix A = $\begin{bmatrix} 0 & a & 1 \\ -1 & b & 1 \\ -1 & c & 0 \end{bmatrix}$ the value of $(a + b + c)^2$ is

_____.

Q18. $\int\limits_{1}^{e} \dfrac{\log x}{x} dx,$ is equal to: **1 Marks**

    A. $\dfrac{e^2}{2}$ B. 1

    C. $\dfrac{1}{2}$ D. $-\infty$

Q19. The area of a triangle formed by vertices O, A and B, where $\vec{OA} = \hat{i} + 2\hat{j} + 3\hat{k}$ and $\vec{OB} = -3\hat{i} - 2\hat{j} + \hat{k}$ is: **1 Marks**

    A. $3\sqrt{5}$ sq. units   B. $5\sqrt{5}$ sq. units

    C. $6\sqrt{5}$ sq. units   D. 4 sq. units

Q20. If vectors $\vec{a}$ and $\vec{b}$ are such that, $|\vec{a}| = 3$, $|\vec{b}| = \dfrac{2}{3}$ and $\vec{a} \times \vec{b}$ is a unit vector, then write the angle **1 Marks**
between $\vec{a}$ and $\vec{b}$.

Q21. Write the distance of the point (3, − 5, 12) **1 Marks**
from x-axis.

Q22. Show that the function $y = ax + 2a^2$ is a solution of the differential equation $2\left(\dfrac{dy}{dx}\right)^2 +$ **1 Marks**
$x\left(\dfrac{dy}{dx}\right) - y = 0$.

Q23. The amount of pollution content added in air in a city due to x-diesel vehicles is given by $P(x) = 0.005x^3$ **1 Marks**
$+ 0.02x^2 + 30x$. Find the marginal increase in pollution content when 3 diesel vehicles are added and write which value is indicated in the above question.

Q24. The two vectors $\hat{j} + \hat{k}$ and $3\hat{i} - \hat{j} + 4\hat{k}$ represent the two sides AB and AC, respectively of a $\triangle$ABC, Find the **1 Marks**
length of the median through A.

Q25. If a line makes angles $90^0, 60^0$ and θ with x, y and z-axis respectively, where θ is acute, **1 Marks**
then find θ.

Q26. If $\begin{bmatrix} x+y & 7 \\ 9 & x-y \end{bmatrix} = \begin{bmatrix} 2 & 7 \\ 9 & 4 \end{bmatrix}$, then x.y = **1 Marks**

_____.

Q27. Find λ, if the vectors $\vec{a} = \hat{i} + 3\hat{j} + \hat{k}$, $\vec{b} = 2\hat{i} - \hat{j} - \hat{k}$ and $\vec{c} = \lambda\hat{j} + 3\hat{k}$ **1 Marks**
are coplanar.

Q28. If $\tan^{-1}x + \tan^{-1}y = \dfrac{\pi}{4}, xy < 1$, then write the value of x **1 Marks**
+ y + xy.

Q29. Write the integrating factor of the differential equation $(\tan^{-1}y -$ **1 Marks**
$x)dy = (1 + y^2)dx$.

Q30. Find adj A, if A =

$$\begin{bmatrix} 2 & -1 \\ 4 & 3 \end{bmatrix}$$

<div style="text-align:right">1 Marks</div>

Q31. Ashima can hit a target 2 out of 3 times. She tried to hit the target twice. The probability that she missed the target exactly once is:

<div style="text-align:right">1 Marks</div>

A. $\frac{2}{3}$

B. $\frac{1}{3}$

C. $\frac{4}{9}$

D. $\frac{1}{9}$

Q32. The value of $\tan^{-1}\left(\tan\frac{7\pi}{6}\right)$ is:

<div style="text-align:right">1 Marks</div>

A. $\frac{\pi}{6}$

B. $\frac{\pi}{2}$

C. $\frac{\pi}{3}$

D. $\frac{7\pi}{6}$

Q33. If A is a square matrix of order 3 and $|A| = 5$, then the value of $|2A'|$ is:

<div style="text-align:right">1 Marks</div>

A. -10   B. 10   C. -40   D. 40

Q34. Find the distance of the plane $3x - 4y + 12z = 3$ from the origin.

<div style="text-align:right">1 Marks</div>

Q35. The corner points of the feasible region of an LPP are (0, 0), (0, 8), (2, 7), (5, 4) and (6, 0). The maximum profit P = 3x + 2y occurs at the point _____.

<div style="text-align:right">1 Marks</div>

Q36. If $\vec{a} = 7\hat{i} + \hat{j} - 4\hat{k}$ and $\vec{b} = 2\hat{i} - 6\hat{j} + 3\hat{k}$, then find projection of $\vec{a}$ on $\vec{b}$.

<div style="text-align:right">1 Marks</div>

Q37. Differentiate $\sin^2(\sqrt{x})$ with respect to x.

<div style="text-align:right">1 Marks</div>

Q38. Write a vector of magnitude 9 units in the direction of vector

$-2\hat{i} + \hat{j} + 2\hat{k}$

<div style="text-align:right">1 Marks</div>

Q39. If $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix} = 8$, write the value of x.

<div style="text-align:right">1 Marks</div>

Q40. The distance of point P(a, b, c) from y-axis is:

<div style="text-align:right">1 Marks</div>

A. b

B. b^2

C. $\sqrt{a^2 + c^2}$

D. $a^2 + c^2$

Q41. If $f : R \rightarrow R$ be defined by $f(x) = (3 - x^3)^{1/3}$, then find fof(x).

<div style="text-align:right">1 Marks</div>

Q42. A problem is given to three students whose probabilities of solving it are $\frac{1}{3}, \frac{1}{4}$ and $\frac{1}{6}$ respectively. If the events of solving the problem are independent, find the probability that at least one of them solves it.

<div style="text-align:right">1 Marks</div>

Q43. If the matrix A = $\begin{bmatrix} 0 & a & -3 \\ 2 & 0 & -1 \\ b & 1 & 0 \end{bmatrix}$ is skew symmetric, find the values of

'a' and 'b'.

<div style="text-align:right">1 Marks</div>

Q44. The binary operation * : R x R → R is defined as a * b = 2a + b. Find (2 * 3) * 4.

<div style="text-align:right">1 Marks</div>

Q45. Find a unit vector in the direction of $\vec{a} =$

$3\hat{i} - 2\hat{j} + 6\hat{k}$

<div style="text-align:right">1 Marks</div>

Q46. Write the number of all possible matrices of order 2 × 2 with each entry 1, 2 or 3.

<div style="text-align:right">1 Marks</div>

Q47. The maximum value of slope of the curve $y = -x^3 + 3x^2 + 12x - 5$ is

<div style="text-align:right">1 Marks</div>

A. 15   B. 12   C. 9   D. 0

Q48. Write the element a_{23} of a 3×3 matrix $A = (a_{ij})$ whose elements a_{ij} are given by $a_{ij} = \frac{|i - j|}{2}$.   **1 Marks**

Q49. The principal value of $\cot^{-1}(-\sqrt{3})$ is   **1 Marks**

A. $-\frac{\pi}{6}$ B. $\frac{\pi}{6}$

C. $\frac{2\pi}{3}$ D. $\frac{5\pi}{6}$

Q50. Find the length of the perpendicular drawn from the origin to the plane $2x - 3y + 6z + 21 = 0$.   **1 Marks**

Q51. If $\vec{a} = x\hat{i} + 2\hat{j} - z\hat{k}$ and $= \vec{b} = 3\hat{i} - y\hat{j} + \hat{k}$ are two equal vectors, then write the value of $x + y + z$.   **1 Marks**

Q52. Write the principal value of $\sec^{-1} (-2)$.   **1 Marks**

Q53. If the cartesian equations of a line are $\frac{3 - x}{5} = \frac{y + 4}{7} = \frac{2z - 6}{4}$, write the vector equation for the line.   **1 Marks**

Q54. Evalute   **1 Marks**

$\int_{0}^{2x} |\sin x| dx$

Q55. Find the position vector of a point which divides the join of points with position vectors $\vec{a} - 2\vec{b}$ and $2\vec{a} + \vec{b}$ externally in the ratio 2:1.   **1 Marks**

Q56. Find the projection of a $\vec{a}$ on $\vec{b}$ if $\vec{a} . \vec{b} = 8$ and $\vec{b} = 2\hat{i} + 6\hat{j} + 3\hat{k}$.   **1 Marks**

Q57. If f and g are two functions from R to R defined as $f(x) = |x| + x$ and $g(x) = |x| - x$, then fog (x) for x<0 is   **1 Marks**

A. 4x   B. 2x   C. 0   D. -4x

Q58. Let A be a 3×3 matrix such that $|adj A| = 64$. Then $|A]$ is equal to: **1 Marks**

A. 8 only   B. - 8 only   C. 64   D. 8 or -8

Q59. If $\vec{a}$ and $\vec{b}$ are unit vectors, then what IS the angle between $\vec{a}$ and $\vec{b}$ for $\vec{a}\sqrt{2}\vec{b}$ to be a unit vector?   **1 Marks**

Q60. If $R = \{(x, y) : x + 2y = 8\}$ is a relation on N, write the range of R.   **1 Marks**

Q61. If $f(x) = x + 7$ and $g(x) = x - 7$, $x \in R$, then find $= \frac{d}{dx}(fog)(x)$.   **1 Marks**

Q62. Which of the following statements is true for the function $f(x) = \begin{cases} x + 3, & x \neq 0 \\ & ? \\ 1 & , & x = 0 \end{cases}$ **1 Marks**

A. f(x) is continuous and differentiable$\forall$ x $\in \mathbb{R}$ B. f(x) is continuous$\forall$ x $\in \mathbb{R}$

C. f(x) is continuous and differentiable$\forall$ x $\in \mathbb{R} - (0)$ D. f(x) is discontinuous at infinitely many points

Q63. Determine the value of the constant 'k' so that the function $f(x) = \begin{cases} \frac{kx}{|x|}, & \text{if } x < 0 \\ 3, & \text{if } x \geq 0 \end{cases}$ is continuous at x = 0.   **1 Marks**

Q64. Find the sum of the degree and the order for the following differential equation: **1 Marks**

$$\frac{d}{dx}\left[\left(\frac{d^2y}{dx^2}\right)^4\right] = 0$$

Q65. Find the projection of the vector $\hat{i} + 3\hat{j} + 7\hat{k}$ on the vector $2\hat{i} - 3\hat{j} + 6\hat{k}$. **1 Marks**

Q66. Given $\int e^x (\tan x + 1) \sec x\, dx = e^x f(x) + c$. **1 Marks**
Write $f(x)$ satisfying the above.

Q67. If the vector $\hat{i} - b\hat{j} + \hat{k}$ is equally inclined to the coordinate axes, then the value of b is: **1 Marks**

    A. -1 B. 1

    C. $-\sqrt{3}$ D. $-\dfrac{1}{\sqrt{3}}$

Q68. Evaluate: **1 Marks**
$\int \sec^2 (7 - 4x)\, dx$

Q69. Write the value of $(\hat{i} \times \hat{j}) \cdot \hat{k} + \hat{i} \cdot \hat{j}$. **1 Marks**

Q70. If A is a non-singular square matrix of order 3 and $A^2 = 2A$, then find the value of $|A|$. **1 Marks**

Q71. If A is a square matrix satisfying $A'A = I$, write the value of $|A|$. **1 Marks**

Q72. Evaluate: **1 Marks**
$\int \dfrac{\cos \sqrt{x}}{\sqrt{x}}\, dx$

Q73. The function $f : R \to [-1, 1]$ defined by $f(x) = \cos x$ is **1 Marks**

    A. Both one-one and onto.   B. Not one-one, but onto.

    C. One-one, but not onto.   D. Neither one-one, nor onto.

Q74. Form the differential equation representing the family of curves $y = \dfrac{A}{x} + 5$, by eliminating the arbitrary constant A. **1 Marks**

Q75. If a matrix has 36 elements, the number of possible orders it can have, is: **1 Marks**

    A. 13   B. 3   C. 5   D. 9

Q76. Form the differential equation representing the family of curves $y = mx$, where m is an arbitrary constant. **1 Marks**

Q77. If $\vec{a} = \hat{i} + 2\hat{j} - \hat{k}$ and $\vec{b} = 3\hat{i} + \hat{j} - 5\hat{k}$ find a unit vector in the direction of $\vec{a} - \vec{b}$. **1 Marks**

Q78. Write the direction cosines of a line equally inclined to the three coordinate axes. **1 Marks**

Q79. If $x \in N$ and $\begin{bmatrix} x+3 & -2 \\ -3x & 2x \end{bmatrix} = 8$, then find the value of x. **1 Marks**

Q80. Write the value of the following integral: **1 Marks**
$\int\limits_{-x/2}^{x/2} \sin^5 x\, dx$

Q81. If $\begin{vmatrix} 2x & 5 \\ 8 & x \end{vmatrix} = \begin{vmatrix} 6 & -2 \\ 7 & 3 \end{vmatrix}$, Write the value of x. **1 Marks**

Q82. If f(x) = x|x|, then $f'(x)$ = _____.

1 Marks

Q83. Find the integrating factor of the differential equation $x\dfrac{dy}{dx} - 2y = 2x^2$.

1 Marks

Q84. If $y = \cos\left(\sqrt{3x}\right)$, then find $\dfrac{dy}{dx}$.

1 Marks

Q85. The value of k for which f(x) = $\begin{cases} 3x + 5, & x \geq 2 \\ kx^2, & x < 2 \end{cases}$ is a continuous function, is:

1 Marks

    A. $-\dfrac{11}{4}$ B. $\dfrac{4}{11}$

    C. 11   D. $\dfrac{11}{4}$

Q86. Evaluate: $\displaystyle\int_{2}^{3} 3^x\,dx$.

1 Marks

Q87. Evaluate: $\displaystyle\int_{0}^{1} \dfrac{2x}{1 + x^2}\,dx$.

1 Marks

Q88. Find the value of x from the following: $\begin{vmatrix} x & 4 \\ 2 & 2x \end{vmatrix} = 0$.

1 Marks

Q89. Let A be a square matrix of order 3×3. Write the value of |2A|, where |A| = 4.

1 Marks

Q90. Find the vector equation of the plane with intercepts 3, -4 and 2 on x, y and z – axis respectively.

1 Marks

Q91. Find the value of x + y from the following equation: $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$.

1 Marks

Q92. If a line has direction ratios 2, −1, −2, then what are its direction cosines?

1 Marks

Q93. The principal value of $\cos^{-1}\left(\cos\dfrac{13\pi}{6}\right)$ is:

1 Marks

    A. $\dfrac{13\pi}{6}$ B. $\dfrac{\pi}{2}$

    C. $\dfrac{\pi}{3}$ D. $\dfrac{\pi}{6}$

Q94. For what value of x, the matrix $\begin{bmatrix} 5-x & x+1 \\ 2 & 4 \end{bmatrix}$ is singular?

1 Marks

Q95. An unbiased coin is tossed 4 times. Find the probability of getting at least one head.

1 Marks

Q96. For A = $\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ write A^{-1}.

1 Marks

Q97. Using principal value, evaluate the following:

1 Marks

$$\sin^{-1}\left(\sin\frac{3\pi}{5}\right)$$

Q98. If $\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$,find the value   **1 Marks**
of x + y.

Q99. The coordinates of the foot of the perpendicular drawn from the point (–2, 8, 7) on the XZ-plane is   **1 Marks**

    A. (–2, –8, 7)   B. (2, 8, –7)   C. (–2, 0, 7)   D. (0, 8, 0)

Q100. Write the principal value of $\tan^{-1}(\sqrt{3})$ –   **1 Marks**
$\cot^{-1}(-\sqrt{3})$.

Q101. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ .find α satisfying $0 < \alpha < \frac{\pi}{2}$ when $A + A^T = \sqrt{2}\, I_2$: where A^T is   **1 Marks**
transpose of A

Q102. The number of points of discontinuity of f defined by f(x)|x| – |x – 1| is   **1 Marks**
_____.

Q103. If $f(x) = x + 7$ and g (x) $= x - 7, x \in$ **1 Marks**
R, find (fog) (7)

Q104. The image of the point (2, –1, 4) in the YZ-plane is: **1 Marks**

    A. (0, –1, 4)   B. (–2, –1, 4)   C. (2, 1, –4)   D. (2, 0, 4)

Q105. Let ∗ be a binary operation, on the set of all non-zero real numbers, given by a ∗ b $= \frac{ab}{5}$ for all a, b ∈ R **1 Marks**
- {0}. Find the value of x, given that 2 ∗ (x ∗ 5) = 10.

Q106.   **1 Marks**
Evaluate:
$$\int \frac{2\cos x}{3\sin^2 x}dx$$
.

Q107. Differentiate $e^{\sqrt{3x}}$, with   **1 Marks**
respect to x.

Q108. Write the position vector of the point which divides the join of points with position vectors $3\vec{a}$ –   **1 Marks**
$2\vec{b}$ and $2\vec{a} + 3\vec{b}$ in the ratio 2 : 1.

Q109. If $\vec{P}$ (1, 5, 4) and $\vec{Q}$ (4, 1, -2), find the direction   **1 Marks**
ratios of $\vec{PQ}$.

Q110. The function f(x) = |x| - x is: **1 Marks**

    A. Continuous but not differentiable at x = 0.   B. Continuous and differentiable at x = 0.
    C. Neither continuous nor differentiable at x = 0.   D. Differentiable but not continuous at x = 0.

Q111. What is the value of the determinant   **1 Marks**
$\begin{vmatrix} 0 & 2 & 0 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{vmatrix}$?

Q112. A black die and a red die are rolled together. Find the conditional probability of obtaining a sum greater **1 Marks**
than 9 given that the black die resulted in a 5.

Q113. $\int x^2 e^{x^3} dx$ equals: **1 Marks**

    A. $\frac{1}{3}e^{x^3} + C$ B. $\frac{1}{3}e^{x^4} + C$
    C. $\frac{1}{2}e^{x^3} + C$ D. $\frac{1}{2}e^{x^2} + C$

Q114. If A is an invertible matrix of order 3 and $|A| = 5$, Then find $|adj. A|$. **1 Marks**

Q115. If $|A| = 2$, where A is a 2×2 matrix, then $|4A^{-1}|$ equals: **1 Marks**

    A. 4   B. 2   C. 8   D. $\frac{1}{32}$

Q116. **1 Marks**
Evaluate:
$$\int_2^3 \frac{1}{x}\,dx.$$

Q117. If $A = \begin{pmatrix} 3 & 5 \\ 7 & 9 \end{pmatrix}$ is written as A = P + Q, where P is a symmetric matrix and Q is skew symmetric matrix, then write the matrix P. **1 Marks**

Q118. Direction cosines of a line perpendicular to both x-axis and z-axis are: **1 Marks**

    A. 1, 0, 1   B. 1, 1, 1   C. 0, 0, 1   D. 0, 1, 0

Q119. Find: **1 Marks**
$$\int \frac{\sin^2 x - \cos^2 x}{\sin x \cos x}\,dx$$

Q120. For what value of 'a' the vectors $2\hat{i} - 3\hat{j} + 4\hat{k}$ and $a\hat{i} - 6\hat{j} - 8\hat{k}$ are collinear? **1 Marks**

Q121. Find the co-factor of a_{12} in the following: **1 Marks**
$$\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$$

Q122. If the binary operation $*$ on the set of integers Z, is defined by $a*b = a + 3b^2$, then find the value of $2*4$. **1 Marks**

Q123. If A is a square matrix such that $A^2 = A$, then $(I - A)^3 + A$ is equal to: **1 Marks**

    A. I   B. 0   C. I - A   D. I + A

Q124. If $|\vec{a}| = 3$, $|\vec{b}| = 4$ and $|\vec{a} \times \vec{b}| = 6$, then the value of $\vec{a}.\vec{b}$ is **1 Marks**

    A. 12   B. 6   C. $3\sqrt{3}$ D. $6\sqrt{3}$

Q125. The sum of the order and the degree of the differential equation $\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right) = \sin y$ is: **1 Marks**

    A. 5   B. 2   C. 3   D. 4

Q126. If A is a square matrix of order 3, with $|A| = 9$, then write the value of $|2.adj.A|$. **1 Marks**

Q127. For what value of k may the function $\begin{cases} k(3x^2 - 5x), & x \le 0 \\ \cos x, & x > 0 \end{cases}$ become continuous? **1 Marks**

    A. 0   B. 1   C. $-\frac{1}{2}$ D. No value

Q128. **1 Marks**
If $(a + bx)e^{\frac{y}{x}} = x$, then prove that
$$x^3 \frac{d^2y}{dx^2} = \left(x\frac{dy}{dx} - y\right)^2.$$

Q129. If $\begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}\begin{pmatrix} 1 & -3 \\ -2 & 4 \end{pmatrix} = \begin{pmatrix} -4 & 6 \\ -9 & x \end{pmatrix}$ write the value of x. **1 Marks**

Q130. Let A = {1, 2, 3}, B = {4, 5, 6, 7} and let f = {(1, 4), (2, 5), (3, 6)} be a function from A to B. State whether f is one-one or not.　　　　　**1 Marks**

Q131. Solve the following matrix equation for

x; $[x \ 1] \begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O$.　　　　　**1 Marks**

Q132. Find the Cartesian equation of the line which passes through the point (−2, 4, −5) and is parallel to the line $\dfrac{x+3}{3} = \dfrac{4-y}{5} = \dfrac{z+8}{6}$.　　　　　**1 Marks**

Q133. Find the integrating factor of the differential equation

$\left(\dfrac{e^{-2}\sqrt{x}}{\sqrt{x}} - \dfrac{y}{\sqrt{x}} \right) = \dfrac{dx}{dy} = 1$.　　　　　**1 Marks**

Q134. Write the differential equation representing the family of curves y = mx, where m is an arbitrary constant.　　　　　**1 Marks**

Q135. What is the range of the function f(x)

$= \dfrac{|x-1|}{(x-1)}$?　　　　　**1 Marks**

Q136. Matrix A $= \begin{bmatrix} 0 & 2b & -2 \\ 3 & 1 & 3 \\ 3a & 3 & -1 \end{bmatrix}$ is given to be symmetric, find values of a and b.　　　　　**1 Marks**

Q137. Construct a 2 × 2 matrix A = [a_{ij}] whose elements are given by $a_{ij} = |(i)^2 - j|$.　　　　　**1 Marks**

Q138. The derivative of log x with respect to $\dfrac{1}{x}$ is　　　　　**1 Marks**

　A. $-\dfrac{1}{x^3}$　　　　　　　　　　B. $-\dfrac{1}{x}$

　C. $-x$　　　　　　　　　　　　　　D. $\dfrac{1}{x}$

Q139. The vector equation of XY-plane is　　　　　**1 Marks**

　A. $\vec{r}.\hat{k} = 0$　　　　　　　　　B. $\vec{r}.\hat{j} = 0$

　C. $\vec{r}.\hat{i} = 0$　　　　　　　　　D. $\vec{r}.\hat{n} = 1$

Q140. If A and B are square matrices of the same order 3, such that |A| = 2 and AB = 21, write the value of |B|.　　　　　**1 Marks**

Q141. $\tan\left(\sin^{-1}\dfrac{3}{5} + \tan^{-1}\dfrac{3}{4} \right)$ is equal to:　　　　　**1 Marks**

　A. $\dfrac{7}{24}$　　　　　　　　　　B. $\dfrac{24}{7}$

　C. $\dfrac{3}{2}$　　　　　　　　　　　D. $\dfrac{3}{4}$

Q142. The interval in which the function f given by $f(x) = x^2 e^{-x}$ is strictly increasing, is:　　　　　**1 Marks**

　A. $(-\infty, \infty)$　　　　　　　　B. $(-\infty, 0)$

　C. $(2, \infty)$　　　　　　　　　　D. $(0, 2)$

Q143. For what value of x, is the following matrix singular?

$\begin{vmatrix} 3\text{-}2x & x+1 \\ 2 & 4 \end{vmatrix}$.　　　　　**1 Marks**

Q144. If $\left| \vec{a} \times \vec{b} \right|^2 + \left| \vec{a}.\vec{b} \right|^2 = 400$ and $\left| \vec{a} \right| = 5$, then write the value of $\left| \vec{b} \right|$.　　　　　**1 Marks**

Q145. A number is chosen randomly from numbers 1 to 60. The probability that the chosen number is a multiple of 2 or 5 is:　　　　　**1 Marks**

A. $\frac{2}{5}$ B. $\frac{3}{5}$

C. $\frac{7}{10}$ D. $\frac{9}{10}$

Q146. A relation in a set A is called _____ relation, if each element of A is related to itself.   1 Marks

Q147. Find the cofactors of all the elements   1 Marks
of $\begin{bmatrix} 1 & -2 \\ 4 & 3 \end{bmatrix}$.

Q148. If [x] denotes the greatest integer function, then   1 Marks

find $\int\limits_{0}^{\frac{3}{2}} [x^2]dx$

Q149. If $\vec{a} = 4\hat{i} - \hat{j} + \hat{k}$ and $\vec{b} = 2\hat{i} - 2\hat{j} + \hat{k}$, then find a unit vector parallel to the   1 Marks
vector $\vec{a} + \vec{b}$.

Q150. Write the vector equation of a line given by $\frac{x-5}{3} =$ 1 Marks
$\frac{y+4}{7} = \frac{z-6}{2}$.

Q151.   1 Marks
Evaluate $\int\limits_{0}^{1} \frac{dx}{1+x^2}$

Q152. Find the value of x - y, if $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} +$ 1 Marks

$\begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$.

Q153. Find the value of a if $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} =$ 1 Marks

$\begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$

Q154. Evaluate: 1 Marks

$\int (ax + b)^3$
dx.

Q155. If a matrix has 5 elements, write all possible orders it   1 Marks
can have.

Q156. If A is a square matrix of order 3 and |A| = 2 then find the   1 Marks
value of |-AA'|.

Q157. $\begin{bmatrix} x+1 & x-1 \\ x^2+x+1 & x^2-x+1 \end{bmatrix}$ is equal to: 1 Marks

A. 2x3   B. 2   C. 0   D. 2x3 – 2

Q158. Write the direction cosines of the line joining the points (1, 0, 0)   1 Marks
and (0, 1, 1).

Q159. If $\begin{bmatrix} 3x & 7 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} 8 & 7 \\ 6 & 4 \end{bmatrix}$,find the   1 Marks
value of x.

Q160. If A is a square matrix of order 2 and |A| = 4, then find the value of $|2.AA'|$, where A' is the transpose   1 Marks
of matrix A.

Q161. For what value of x, is the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew-   1 Marks
symmetric matrix?

Q162. Find

$$\int \frac{2^{x+1} - 5^{x-1}}{10^x} dx$$

1 Marks

Q163. If A is a non-singular square matrix of order 3 such that $A^2 = 3A$, then value of $|A|$ is:

1 Marks

    A. −3   B. 3   C. 9   D. 27

Q164. Find $\vec{a} \cdot (\vec{b} \times \vec{c})$, if $\vec{a} = 2\hat{i} + \hat{j} + 3\hat{k}$, $\vec{b} = -\hat{i} + 2j + \hat{k}$ and $\vec{c} = 3\hat{i} + \hat{j} + 2\hat{k}$.

1 Marks

Q165.

1 Marks

Evaluate:

$$\int_0^{2\pi} \cos^5 x \, dx.$$

Q166. For what value of k, the system of linear equations

1 Marks

$x + y + z = 2$

$2x + y - z = 3$

$3x + 2y + kz = 4$

has a unique solution?

Q167. For what value of λ are the vectors $\vec{a} = 2\hat{i} + \lambda\hat{j} + \hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$ prependicular to each other?

1 Marks

Q168. If $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \begin{pmatrix} 3 & 1 \\ 2 & 5 \end{pmatrix} = \begin{pmatrix} 7 & 11 \\ k & 23 \end{pmatrix}$, then write the value of k.

1 Marks

Q169. $\int_0^{\frac{\pi}{6}} \sec^2(x - \frac{\pi}{6}) \, dx$ is equal to:

1 Marks

    A. $\frac{1}{\sqrt{3}}$ B. $-\frac{1}{\sqrt{3}}$

    C. $\sqrt{3}$ D. $-\sqrt{3}$

Q170.

1 Marks

Evaluate:

$$\int_1^3 |2x - 1| dx$$

Q171. The least value of the function $f(x) = ax + \frac{b}{x} (a > 0, b > 0, x > 0)$ is

1 Marks

_____.

Q172. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ nd $(31 + 4A)(3I + 4A) = x^2 I$, then the value(s) x is/ are:

1 Marks

    A. $\pm\sqrt{7}$ B. 0   C. ± 5 D. 25

Q173. If $\int_0^a \frac{1}{4 + x^2} dx = \frac{\pi}{8}$, find the value of a.

1 Marks

Q174. Simplify: $\cos\theta \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} + \sin\theta \begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$.

1 Marks

Q175. From the set {1, 2, 3, 4, 5}, two numbers a and b (a ≠ b) are chosen at random. The probability that $\frac{a}{b}$ is an integer is:

1 Marks

    A. $\frac{1}{3}$ B. $\frac{1}{4}$

C. $\frac{1}{2}$ D. $\frac{3}{5}$

Q176.   **1 Marks**

If $f : R \to R$ be given by $f(x) = (3 - x^3)^{\frac{1}{3}}$, fof $(x) =$

_____.

Q177. If $|\vec{a}| = 4|\vec{b}| = 3$ and $\vec{a}.\vec{b} = 6\sqrt{3}$, then find the value **1 Marks**
of $|\vec{a} \times \vec{b}|$.

Q178.   **1 Marks**

If $\triangle = \begin{vmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{vmatrix}$, write the minor of the

element a_{23}.

Q179. If $3A - B = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, then find the **1 Marks**

matrix A.

Q180. If $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$, then find the **1 Marks**

matrix A.

Q181. Direction cosines of the line $\frac{x-1}{2} = \frac{1-y}{3} = \frac{2z-1}{12}$ are: **1 Marks**

A. $\frac{2}{7}, \frac{3}{7}, \frac{6}{7}$ B. $\frac{2}{\sqrt{157}}, -\frac{3}{\sqrt{157}}, \frac{12}{\sqrt{157}}$

C. $\frac{2}{7}, \frac{3}{7}, -\frac{6}{7}$ D. $\frac{2}{7}, -\frac{3}{7}, \frac{6}{7}$

Q182. Evaluate, **1 Marks**

$\int_0^3 \frac{dx}{9 + x^2}$.

Q183. If $(x - a)^2 + (y - b)^2 = c^2$, for some c > 0, **1 Marks**

prove that

$\dfrac{\left[1 + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}}}{\frac{d^2y}{dx^2}}$ is a constant independent of a and

b.

Q184.   **1 Marks**

If $A = \begin{bmatrix} 2 & 0 & 0 \\ -1 & 2 & 3 \\ 3 & 3 & 5 \end{bmatrix}$, then find A

(adj A).

Q185. Let $A = \{1, 3, 5\}$. Then the number of equivalence relations in A containing (1, 3) is: **1 Marks**

A. 1   B. 2   C. 3   D. 4

Q186. Write the adjoint of the following **1 Marks**
matrix:
$\begin{pmatrix} 2 & -1 \\ 4 & 3 \end{pmatrix}$

Q187. Find the differential of the function **1 Marks**
$\cos^{-1}(\sin 2x)$ w.r.t. x.

Q188. Write the degree of the differential equation $x^3 \left(\frac{d^2y}{dx^2}\right)^2 +$ **1 Marks**

$x\left(\frac{dy}{dx}\right)^4 = 0$.

Q189. Evaluate: **1 Marks**
$\int \cos^{-1}(\sin x)\, dx$.

Q190. The two lines $x = ay + b$, $z = cy + d$; and $x = a'y + b'$, $z = c'y + d'$ are perpendicular to each other, if: **1 Marks**

A. $\frac{a}{a'} + \frac{c}{c'} = 1$

B. $\frac{a}{a'} + \frac{c}{c'} = -1$

C. $aa' + cc' = 1$

D. $aa' + cc' = -1$

Q191. If A is a 3×3 invertible matrix, then what will be the value of k if **1 Marks**
$\det(A^{-1}) = (\det(A))^k$.

Q192. If $\frac{d}{dx}(f(x)) = \log x$, then $f(x)$ equals: **1 Marks**

A. $-\frac{1}{x} + C$

B. $x(\log x - 1) + C$

C. $x(\log x + x) + C$

D. $\frac{1}{x} + C$

Q193. Evaluate : $\sin\left[\dfrac{\pi}{3} - \sin^{-1}\left(-\dfrac{1}{2}\right)\right]$ **1 Marks**

Q194. If $|A| = 3$ and $A^{-1} = \begin{bmatrix} 3 & -1 \\ -\frac{5}{3} & \frac{2}{3} \end{bmatrix}$, then write the adj A. **1 Marks**

Q195. Write the value of $\int \sec x\,(\sec x + \tan x)\,dx$. **1 Marks**

Q196. If $f(x) = x + 1$, find $\frac{d}{dx}(f \circ f)(x)$. **1 Marks**

Q197. Find the differential equation representing the family of curves $y = ae^{2x} + 5$, where a is an arbitrary constant. **1 Marks**

Q198. The distance of the origin $(0, 0, 0)$ from the plane $-2x + 6y - 3z = -7$ is: **1 Marks**

A. 1 unit

B. $\sqrt{2}$ unit

C. $2\sqrt{2}$ unit

D. 3 unit

Q199. If $|\vec{a}| = 4$ and $-3 \le \lambda \le 2$, then, $|\lambda\vec{a}|$ lies in: **1 Marks**

A. [0, 12] B. [2, 3] C. [8, 12] D. [−12, 8]

Q200. If $(2\ \ 1\ \ 3)\begin{pmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{pmatrix}\begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix} = A$, then write the order of matrix A. **1 Marks**

Q201. Evaluate: $\displaystyle\int_2^4 \frac{x}{x^2 + 1}\,dx$. **1 Marks**

Q202. Write a unit vector in the direction of $\vec{a} = 2\hat{i} - 6\hat{j} + 3\hat{k}$. **1 Marks**

Q203. Find the value of k, so that the function $f(x) = \begin{cases} kx^2 + 5, & \text{if } x \le 1 \\ 2, & \text{if } x > 1 \end{cases}$ is continuous at $x = 1$. **1 Marks**

Q204. What is the cosine of the angle which the vector $\sqrt{2}\hat{i} + \hat{j} + \hat{k}$. **1 Marks**

Q205. Find the general solution of the differential equation **1 Marks**
$e^{y-x}\dfrac{dy}{dx} = 1$.

Q206. If $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ nd $(3I + 4A)(3I + 4A) = x^2I$, then the value(s) x is/ are: **1 Marks**

A. $\pm\sqrt{7}$ B. 0   C. ± 5 D. 25

Q207. The value of k so that f defined by $f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right) & \text{if } x \neq 0 \\ k & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$ is **1 Marks**

A. 0   B. $\frac{1}{2}$ C. 1   D. 2

Q208. P and Q are two points with position vectors $3\vec{a} - 2\vec{b}$ and $\vec{a} + \vec{b}$ respectively. Write the position vector of a point R which divides the line segment PQ in the ratio 2:1 externally. **1 Marks**

Q209. $\int \frac{1}{x \log x} dx$ is equal to: **1 Marks**

A. $\frac{(\log x)^2}{2} + c$ B. $\log |\log x| + c$

C. $\log |x \log x| + c$ D. $\frac{1}{\log x} + c$

Q210. Find the order of the differential equation of the family of circles of radius 3 units. **1 Marks**

Q211. If $\begin{bmatrix} 2x & -9 \\ -2 & x \end{bmatrix} = \begin{bmatrix} -4 & 8 \\ 1 & -2 \end{bmatrix}$, the value of x is _____. **1 Marks**

Q212. The order of the differential equation of the family of circles touching x-axis at the origin is: **1 Marks**

A. 1   B. 2   C. 3   D. 4

Q213. If $A = \begin{pmatrix} 1 & 2 & 3 & -1 \end{pmatrix}$ and B = $\begin{pmatrix} 1 & -4 & 3 & -2 \end{pmatrix}$, find $|AB|$. **1 Marks**

Q214. Form the differential equation representing the family of curves $y = A \sin x$, by eliminating the arbitrary constant A. **1 Marks**

Q215. If $y = \sin^{-1} x + \cos^{-1} x$, find $\frac{dy}{dx}$. **1 Marks**

Q216. Write the coordinates of the point which is the reflection of the point (α, β, γ) in the XZ-plane. **1 Marks**

Q217. If for any 2×2 square matrix A, $A(\text{adj } A) = \begin{bmatrix} 8 & 0 \\ 0 & 8 \end{bmatrix}$, then write the value of $|A|$. **1 Marks**

Q218. Find the vector equation of a plane which is at a distance of 5 units from the origin and its normal vector is $2\hat{i} - 3\hat{j} + 6\hat{k}$. **1 Marks**

Q219. Write the principal value of $\cos^{-1}\left(\cos \frac{7\pi}{6}\right)$. **1 Marks**

Q220. Write the principal value of $\tan^{-1}(1) + \cos^{-1}\left(-\frac{1}{2}\right)$. **1 Marks**

Q221. The position vectors of two points A and B are $\overrightarrow{OA} = 2\hat{i} - \hat{j} - \hat{k}$ and $\overrightarrow{OB} = 2\hat{i} - \hat{j} - 2\hat{k}$, respectively. The position vector of a point P which divides the line segment joining A and B in the ratio 2 : 1 is _____. **1 Marks**

Q222. $\int 4^x 3^x dx$ equals: **1 Marks**

A. $\frac{12^x}{\log 12} + C$ B. $\frac{4^x}{\log 4} + C$

C. $\left(\frac{4^x \cdot 3^x}{\log 4 \cdot \log 3}\right) + C$ D. $\frac{3^x}{\log 3} + C$

Q223. If $\vec{a}$, $\vec{b}$, $\vec{c}$ are unit vectors such that $\vec{a}$, $\vec{b}$, $\vec{c}$ = $\vec{0}$, then write the value of
$\vec{a} \cdot \vec{b} + \vec{b} \cdot \vec{c} + \vec{c} \cdot \vec{a}$.

1 Marks

Q224. If $A = \begin{vmatrix} 2 & 3 \\ 5 & -2 \end{vmatrix}$, write A^{-1} in
terms of A.

1 Marks

Q225. Find $\dfrac{dy}{dx}$, if xy^2 -
$x^2 = 4$.

1 Marks

Q226. Write the principal value of $\cos^{-1}\left(\dfrac{1}{2}\right)$ –
$2\sin^{-1}\left(-\dfrac{1}{2}\right)$.

1 Marks

Q227. Find the interval in which the function f given by $f(x) = 7 - 4x - x^2$ is strictly
increasing.

1 Marks

Q228. Write the value of
$\begin{vmatrix} a-b & b-c & c-a \\ b-c & c-a & a-b \\ c-a & a-b & b-c \end{vmatrix}$.

1 Marks

Q229. If A is a square matrix of order 2 and $|A| = 4$, then find the value of $|2 \cdot AA'|$, where A' is the transpose of matrix A.

1 Marks

Q230. Find the value of
$\int_0^1 \tan^{-1}\left(\dfrac{1-2x}{1+x-x^2}\right) dx.$

1 Marks

Q231. Find the differential equation representing the family of curves $v = \dfrac{A}{r} + B$, where A and B are
arbitrary constants.

1 Marks

Q232. Find the value of p if
$(2\hat{i} + 6\hat{j} + 27\hat{k}) \times (\hat{i} + 3\hat{j} + p\hat{k}) = \vec{0}.$

1 Marks

Q233. If $y = 5e^{7x} + 6e^{-7x}$, show that
$\dfrac{d^2y}{dx^2} = 49y.$

1 Marks

Q234.
Evaluate: $\int \dfrac{x^2}{1+x^3} dx$

1 Marks

Q235. If $\begin{bmatrix} 2x & 5 \\ 8 & x \end{bmatrix} = \begin{bmatrix} 6 & -2 \\ 7 & 3 \end{bmatrix}$, , Write the
value of x.

1 Marks

Q236. A function $f : R_+ \longrightarrow R$ (where R_+ is the set of all non-negative real numbers) defined by $f(x) = 4x + 3$ is:

1 Marks

A. one-one but not onto

B. onto but not one-one

C. both one-one and onto

D. neither one-one nor onto

Q237. The primitive of $\dfrac{2}{1+\cos 2x}$ is:

1 Marks

A. sec2 x

B. 2 sec2 x tan x

C. tan x

D. -cot x

Q238. Find $|AB|$, if $A = \begin{bmatrix} 0 & -1 \\ 0 & 2 \end{bmatrix}$ and
$B = \begin{bmatrix} 3 & 5 \\ 0 & 0 \end{bmatrix}$.

1 Marks

Q239. Use elementary column operation $C_2 \to C_2 + 2C_1$ in the following matrix $\qquad$ **1 Marks**

equation:

$$\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ -1 & 1 \end{bmatrix}$$

Q240. If $\sin\left(\sin^{-1}\dfrac{1}{5} + \cos^{-1}x\right) = 1$, then find the $\qquad$ **1 Marks**

vatue of x.