MATHS

BOOKS - SHARAM PUBLICATION

MODEL QUESTION PAPER-18

Exercise

1. If a set A has n elements and another set B has m elements, what is the number of relations from A to B ?

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2. What is the value of $2\tan^{-1}\left(\frac{1}{3}\right)+\tan^{-1}\left(\frac{1}{7}\right)$?

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3. State the feasible solution.

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4. Determine the maximum value of $\begin{vmatrix} \cos x & \sin x \\ -\sin x & \cos x - 1 \end{vmatrix}$.

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5. Differentiate $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ w.r.t $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ when $x \neq 0$.

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6. Write the equation of the tangent to the curve y=[x] at the point (-2,2).

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7. Find $\int_{-\pi/4}^{\pi/4} \sin^3 x dx$

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8. Write the order of the differential equation whose general solution is $y = ax^2 + b$, where a

and b are arbitrary constants.

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9. Write the scalar projection of the vector $\vec{a} = 2\hat{i} - \hat{j} + \hat{k}$ on the vector $\vec{b} = \hat{i} + 2\hat{j} + 2\hat{k}$.

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10. Write the equation of the line parallel to the line $\frac{x-2}{-3} = \frac{3-y}{-2} = \frac{z+5}{6}$ and passing

through the point $(1, 2, 3)$.

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11. If $y = \cos^{-1}\sqrt{x}$ then find $\frac{dy}{dx}$.

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12. If $y = a\sin x + b\cos x$ then prove that $y^2 + \left(\frac{dy}{dx}\right)^2 = a^2 + b^2$.

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13. Find the points on the curve $y = x^3 - 11x + 5$ at which the equation of the tangent is $y = x - 11$.

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14. Find the point P on the curve $y^2 = 4ax$, which is nearest to the point (11a, 0).

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15. Evaluate $\int (x + 3)(2 - x)dx$.

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16. Evaluate $\int_0^a \frac{\sqrt{x}}{\sqrt{x}+\sqrt{a-x}}dx$

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17. $\int_0^{\pi} \frac{x \sin x dx}{1+\cos^2 x}$

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18. Using integration, find the area of the region bounded by the curves $y = x^2$ and $y = x$.

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19. Let R is the equivalence in the set A = {0, 1, 2, 3, 4, 5} given by R = {(a, b) : 2 divides (a - b)}. Write the equivalence class [0].

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20. If F : R $\rightarrow$ R is given by f(x) = $\left(3 - x^3\right)^{1/3}$ then find (fof) x .

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21. Let * is the binary operation on N given by $a * b = HCF$ (a, b), where $a, b \in N$. Write the value of $22 * 4$.

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22. Solve: $\tan^{-1} x + 2\cot^{-1} x = \frac{2\pi}{3}$

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23. Write the solution of the following L.P.P.

Maximize $z = 3x + 2y$

subject to $x + y \leq 400$,

$2x + y \leq 500,$

$x \geq 0, y \geq 0.$

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24. IF A_y is the cofactor of the element a_y of the determinant $\begin{vmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{vmatrix}$ then write the value of a_{32}. A_{32}

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25. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$ then find the value of $A^2 - 3A + 2I$

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26. Prove that $\begin{vmatrix} x+y & x & x \\ 5x+4y & 4x & 2x \\ 10x+8y & 8x & 3x \end{vmatrix} = x^3$

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27. Show that:

$$\begin{vmatrix} a & a^2 & a^3 \\ b & b^2 & b^3 \\ c & c^2 & c^3 \end{vmatrix} = abc(a-b)(b-c)(c-a)$$

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28. Find the inverse of $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$ by using elementary row operation.

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29. Find the vector $\vec{p}$ which is perpendicular to both $\vec{\alpha} = 4\hat{i} + 5\hat{j} - \hat{k}$, $\vec{\beta} = \hat{i} - 4\hat{j} + 5\hat{k}$ and $\vec{p} \cdot \vec{q} = 21$ where $q = 3\hat{i} + \hat{j} - \hat{k}$.

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30. Find a unit vector perpendicular to both of the vectors $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ where $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ and $b = \hat{i} + 2\hat{j} + 3\hat{k}$.

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31. Show that the lines $\frac{x+3}{2}=\frac{y+5}{3}=\frac{z-7}{-3}$ and $\frac{x+1}{4}=\frac{y+1}{5}=\frac{z+1}{-1}$ are co-planar.

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32. Prove that the measure of the angle between two main diagonals of a cube is $\cos^{-1}\frac{1}{3}$.

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33. Find the equation of the plane passing through the intersection of the planes 3x + y- z = 2 and x-y + 2z =1and the point (1, 0,2)

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34. If $f(x) = \begin{cases} \frac{1-\cos 4x}{x^2} & when x < 0 \\ a & when x = 0 \\ \frac{\sqrt{x}}{\sqrt{16+\sqrt{x}}+4} & when x > 0 \end{cases}$. is continuous at x=0, then the value of a will be.

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35. If $y = x^{\sin x - \cos x} + \frac{x^2 - 1}{x^2 + 1}$, then find $\frac{dy}{dx}$

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36. Show that the semi-vertical angle of the cone of the maximum volume and of given slant height is $\frac{\cos^{-1}(1)}{\sqrt{3}}$.

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37. Evaluate the following integrals :

Evaluate $\int_0^{\pi/2} \frac{x \sin x \cos x}{\sin^4 x + \cos^4 x}$

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38. Find the area of region in the first quadrant enclosed by the X-axis, the line $y = x$ and the circle $x^2 + y^2 = 32$.

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39. Solve the following differential $x\frac{dy}{dx} = y - x\tan\left(\frac{y}{x}\right)$.

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40. Show that

$$\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = 2abc(a+b+c)^3$$

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41. Solve for x, $\cos^{-1} x + \sin^{-1}\left(\frac{x}{2}\right) = \frac{\pi}{6}$.

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42. Write the vector equations of the following lines and hence determine the distance between them $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z+4}{6}$ and $\frac{x-3}{4}=\frac{y-3}{6}=\frac{z+5}{12}$.

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