MATHS

BOOKS - SHARAM PUBLICATION

MODEL QUESTION PAPER 13

Exercise

1. If f: R $\rightarrow$ R is defined by f(x) = 3x + 2 define f (f (x))

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2. If $\sin^{-1}\left(\frac{\pi}{5}\right) + \cos ec^{-1}\left(\frac{5}{4}\right) = \frac{5}{2}$.

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3. Evaluate $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ -10 & 12 & 2 \end{vmatrix}$?

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4. If I_n is an identity matrix of order n, then k being a natural number, write the matrix I_n^k.

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5. If a function f(x) is defined by f(x) $= \begin{cases} (1+7x)^{\frac{1}{x}} & when x \neq 0 \\ k & when x = 0 \end{cases}$ is continuous at x = 0, then what is the value of k.?

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6. What is the maximum value of the function f(x)=sinx(1 + cos x) ?

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7. Write the value of $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin x + \cos x} dx - \int_0^{\frac{\pi}{2}} \frac{\cos x}{\sin x + \cos x} dx$

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8. If p and q are the order and degree of the differential equation $y\left(\frac{dy}{dx}\right)^2 + x^2 \frac{d^2y}{dx^2} + xy = \sin x$, then choose the correct statement out of

$p < q$

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9. Write the value of the cosine of the angle which the vector $\vec{a} = \hat{i} + \hat{j} + \hat{k}$ makes with y-axis

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10. Write the intercepts cutoff by the plane 2x+y-z =5 on three axes.

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11. Show that the relation S in set $A = \{x \in Z : 0 \leq x \leq 12\}$ given by $S = \{(a, b) : a, b \in A, |a - b|$ is divisible by 4$\}$ is an equivalence relation. Find the set of all elements related to 1.

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12. Prove that $\tan^{-1}\sqrt{x} = \frac{1}{2}\cos^{-1}\left(\frac{1-x}{1+x}\right), x \in (0, 1).$

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13. Solve: $\sin^{-1}\left(\frac{2a}{1+a^2}\right) + \sin^{-1}\left(\frac{2b}{1+b^2}\right) = 2\tan^{-1}x.$

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14. Solve the following LPP graphically

Maximize, $Z = 20x + 30y$

Subject to $3x + 5y \leq 15$

$x, y \geq 0.$

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15. Find the inverse of the matrix $\begin{bmatrix} 0 & 0 & 2 \\ 0 & 2 & 0 \\ 2 & 0 & 0 \end{bmatrix}$.

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16. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ then show that $A^k = \begin{bmatrix} 1+2k & -4k \\ k & 1-2k \end{bmatrix}, k \varepsilon N$

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17. Prove without expanding that $\begin{vmatrix} bc & a & a^2 \\ ca & b & b^2 \\ ab & c & c^2 \end{vmatrix} = \begin{vmatrix} 1 & a^2 & a^3 \\ 1 & b^2 & b^3 \\ 1 & c^2 & c^3 \end{vmatrix}$

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18. Solve : $\begin{vmatrix} x-a & 0 & 0 \\ a & x-b & 0 \\ a & b & x-c \end{vmatrix} = 0$

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19. Prove that: $\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^2 & b^2 & c^2 \end{vmatrix} = (a-b)(b-c)(c-a)$

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20. Find the value of k, so that the function defined by $f(x) = \begin{cases} kx+1, & \text{if } x \leq \pi \\ \cos x, & \text{if } x > \pi \end{cases}$ is continuous at $x = \pi$.

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21. If $x^y = e^{x-y}$ then prove that $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$.

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22. If $x = a\sec\theta, y = b\tan\theta$, then prove that $\frac{d^2y}{dx^2} = -\frac{b^4}{a^2y^3}$

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23. Find the points on the curve $x^2 + y^2 - 2x - 3 = 0$ at which the tangents are parallel to X-axis.

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24. For which value of x, the function $f(x) = 4 - x - x^2$is maximum or minimum.

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25. Evaluate $\int (x+3)^2 dx$

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26. Evaluate $\int_0^{\pi} \left(\frac{2}{4}\right) \sin \sqrt{x} dx$

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27. Evaluate $\int \sin^{-1} x dx$

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28. Find the area bounded by the line y = 2x, x- axis and the ordinate x = 3.

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29. Solve $\frac{dy}{dt} = e^{3t+5y}$

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30. If the position vectors of the points A, B, C are $2\hat{i} + \hat{j} - \hat{k}, 3\hat{i} - 2\hat{j} + \hat{k}$ and $\hat{i} + 4\hat{j} - 3\hat{k}$ respectively, then prove that A, B, C are collinear.

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31. If $\vec{a}$ = (2,-2,1), $\vec{b}$ = (2,3,6) and $\vec{c}$ = (-1,0,2), Find the magnitude and direction of $\vec{a} - \vec{b} + 2\vec{c}$.

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32. Find the perpendicular distance of the point $(-1, 3, 9)$ from the line $\frac{x-13}{5} = \frac{y+8}{-8} = \frac{z-31}{1}$

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33. Find the equation of the plane passing through (3,-6,-9) and parallel to xz plane

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34. If f:$R \to R$, $g: R \to R$ and $h: R \to R$ such that f(x)=x^2, $g(x)$= tan x and h(x)= log x then find [ho (gof)] (x) at$x = \frac{\sqrt{\pi}}{2}$

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35. If $\cos^{-1}\left(\frac{x}{a}\right) = \cos^{-1}\left(\frac{y}{b}\right) = \theta$, prove that $\frac{x^2}{a^2} - \frac{2xy}{ab}\cos\theta + \frac{y^2}{b^2} = \sin^2\theta$.

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36. Prove the following:

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

=2(b+c)(c+a)(a+b)

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37. Evaluate $\int_0^{\pi/2} \frac{\cos x}{(2+\sin x)(3+\sin x)} dx$

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38. Find the area of the region between the curves $y = \cos x$ and $y = \sin x, x \in \left[0, \frac{\pi}{4}\right]$.

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39. Solve (x-y+1)dx-(x+y+5)dy=0

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40. Show that the following vector are co-planar. $\hat{i} - 2\hat{j} + 2\hat{k}, 3\hat{i} + 4\hat{j} + 5\hat{k}, -2\hat{i} + 4\hat{j} - 4\hat{k}.$

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41. Find the equation of the plane through the points (2, 2,1)and (9, 3, 6)and perpendicular to the plane 2x + 6y + 6z -1 = 0.

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