MATHS

BOOKS - SHARAM PUBLICATION

QUESTION PAPER 2018

Exercise

1. Sets A and B have respectively m and n elements. The total number of relations from A to B is 64. If $m < n$ and $m \neq 1$, write the values of m and n respectively.

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2. Write the principal value of $\sin^{-1}\left(-\frac{1}{2}\right)+\cos^{-1}\cos\left(-\frac{\pi}{2}\right)$

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3. If every element of a third order determinant of value 8 is multiplied by 2, then write the value of the new determinant.

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4. Write the interval in which the function $f(x) = \sin^{-1}(2 - x)$ is differentiable.

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5. A balloon is pumped at the rate of 2 cm^3 / minute. Write the rate of increase of the surface area, when the radius is 0.5 cm.

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6. Write the definite integral which is equal to

$$\lim_{n \to \infty} \frac{1}{n} \sum_{r=1}^{n} \frac{r}{\sqrt{n^2 + r^2}}$$

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7. If p and q are respectively degree and order of the differential equation $y = e^{dy/dx}$, then write the relation between p and q.

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8. If $\left(\vec{a} \times \vec{b}\right)^2 + \left(\vec{a} \cdot \vec{b}\right)^2 = 144$, write the value of ab.

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9. Write the equations of the line $2x + z - 4 = 0 = 2y + z$ in the symmetrical form.

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10. Let ~ be defined by (m,n)~(p,q) if mq=np where m, n, p,$q \in Z$-{0}. Show that it is an equivalence relation.

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11. $\text{Let} f(x) = \sqrt{x} \text{and} g(x) = 1 - x^2.$ Compute fog and gof and find their natural domains.

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12. Show that $\sin^{-1}\frac{4}{5} + 2\tan^{-1}\frac{1}{3} = \frac{\pi}{2}.$

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13. Prove the $\sin^{-1}\sqrt{\frac{x-q}{p-q}} = \cos^{-1}$sqrt((p-x)/(p-q))="cot"^(-1) sqrt((p-x)/(x-q))`

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14. Sole the following LPP graphically

Minimize $Z = 4x + 3y$

subject to $2x + 5y \geq 10$and $x, y \geq 0.$

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15. If A,B,C are matrices of order 2×2 each and

$$2A + B + C = \begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}$$

$$A + B + C = \begin{bmatrix} 0 & 1 \\ 2 & 1 \end{bmatrix}$$

$$A + B - C = \begin{bmatrix} 1 & 2 \\ 1 & 0 \end{bmatrix}$$ find A,B and C.

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16. Find the inverse of the following matrix

$$\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 2 \\ 1 & 2 & 1 \end{bmatrix}.$$

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17. Prove that the following.

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

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18. A bag A contains 2 white and 3 red balls and another bag B contains 4 white and 5 red balls. One ball is drawn at random from a bag chosen at random and it is found to be red. Find the probability that it was drawn from bag B.

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19. If $P(A) = 0.6$, $P\left(\frac{B}{A}\right) = 0.5$, find $P(A \cup B)$ when A and B are independent.

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20. Differentiate

$$\tan^{-1} \frac{\sqrt{1+x^2} + \sqrt{1-x^2}}{\sqrt{1+x^2} - \sqrt{1-x^2}}$$

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21. Differentiate $y = (\sin y)^{\sin 2x}$

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22. Test the differentiability and continuity of the following function at x=0:

$$f(x) = \begin{cases} \frac{1-e^{-x}}{x} & x \neq 0 \\ 1 & x = 0 \end{cases}$$

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23. Show that the sum of the intercepts on the coordinate axes of any tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is constant.

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24. Show that $2\sin x + 3\tan x > 3x$ for all $\xi n\left(0, \frac{\pi}{2}\right)$

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25. Evaluate $\int \frac{dx}{(x+1)\sqrt{1-x^2}}$

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26. Show that

$$\int_0^1 \frac{Inx}{\sqrt{1-x^2}} dx = \frac{\pi}{2} In \frac{1}{2}$$

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27. Find the area enclosed bt the two paraboles $y^2 = 4$ ax and $x^2 = 4$ay.

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28. From the differential equation whose general solution is $y = a \sin t + be^t$.

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29. Solve the following differential equations

$$\left(1+y^2\right)dx+\left(x-e^{-\tan^{-1}y}\right)dy=0$$

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30. Find the area of the triangle ABC with vertices A(1,2,4), B(3,1,-2) and C(4,3,1) by vector method.

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31. Show that

$$\left[\vec{a}+\vec{b}\,\vec{b}+\vec{c}\,\vec{c}+\vec{a}\right]=2\left[\vec{a}\,\vec{b}\,\vec{c}\right]$$

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32. If the sum of two unit vectors is a unit vector, show that the magnitude of their difference is $\sqrt{3}$.

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

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34. The position vectors of two points A and B are $3\hat{i}+\hat{j}+2\hat{k}$ and $\hat{i}-2\hat{j}-4\hat{k}$, respectively. Find the equation of the plane passing through B and prependicular to AB.

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35. Let $f: X \to Y$ and $g: Y \to Z$. Prove that gof is bijective if both f and g are bijective. Also prove that $(gof)^{-1} = f^{-1}og^{-1}$.

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36. In a triangle ABC if $m\angle A = 90^\circ$,

prove that $\tan\hat{}(-1)\ b/(a+b) + \dfrac{\tan^{-1}c}{a+b} = \dfrac{\pi}{4}$.

where a,b,c, are sides of the triangle.

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37. Solve the following system of equations by the matrix inversion method.

$x + y + z = 4$

$2x - y + 3z = 1$

and $3x + 2y - z = 1$

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38. Two cards are drawn successively with replacement from a well-shuffled deck of 52 cards. Find the probability distribution of the number of aces.

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39. By elementary operations, find A^{-1} for the following: $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & -1 & 1 \\ 1 & -1 & 2 \end{bmatrix}$

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40. If $x = \frac{1-\cos^2\theta}{\cos\theta}, y = \frac{1-\cos^{2n}\theta}{\cos^n\theta}$ then show that $\left(\frac{dy}{dx}\right)^2 = n^2\left(\frac{y^2+4}{x^2+4}\right)$

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41. Find the coordinates of the point on the curve

$x^2y - x + y = 0$

where the slope of the tangent is maximum.

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42. Evaluate: $\int\left(\frac{2\cos x + 7}{4 - \sin x}\right)dx$

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43. Find the solution of the following differential equations:

(4x+6y+5)dx-(2x+3y+4)dy=0

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44. Find the area enclosed by $y = 4x - 1$ and $y^2 = 2x$.

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45. If $a = 2\hat{i} + \hat{k}, b = \hat{i} + \hat{j} + \hat{k}$ and $c = 4\hat{i} - 3\hat{j} + 7\hat{k}$, then find the vector $\vec{r}$ which satisfies $r \times b = c \times b$ and $r.a = 0$.

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46. Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$ and $\frac{x+3}{-3} = \frac{y-7}{2} = \frac{z-6}{4}$ Find also the equation of the line of shortest distance.

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