MATHS

BOOKS - PRADEEP PUBLICATION

MODEL PAPER (2)

Exercise

1. Let A={a,b,c} and R={(a,a),(b,b),(a,b),(b,c),(a,c)} be a relation on A. Is R transitive?

2. Evaluate $\int_{-1}^{1} \log\left(\frac{x^2+x+1}{x^2-x+1}\right)dx.$

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3. A set of D.R of the line

$\vec{r} = \left(\hat{i}+\hat{j}+\hat{k}\right)+1\left(2\hat{i}+3\hat{j}+6\hat{k}\right)$ are

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4. Observe the following pattern :

$$1^2 = 1$$
$$11^2 = 121$$
$$111^2 = 12321$$
$$1111^2 = 1234321$$
$$11111^2 = 123454321$$

.

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5. Show that $\frac{1}{x^2}$ is an integrating factor for the differential equation

$xdy - ydx = x^4 - x, x > 0.$

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6. Let $f(x) = \begin{cases} x \sin\left(\frac{1}{x}\right) & x \neq 0 \\ k & x = 0 \end{cases}$ find k if f is continuous at x=0,

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7. Evaluate $\lim_{x \to 0} t[\cos x]$ if it exists. Here [] denotes the greatest integer function.

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8. If $y = \sqrt{x+1} + \sqrt{x-1}$, prove that $\sqrt{x^2-1}\frac{dy}{dx} = \frac{1}{2}y$.

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9. Evaluate $\int_{-1}^{1} \frac{1}{1+e^x} dx$.

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10. Find the equation of the plane given that the foot of perpendicular drawn from the origin into the plane is (1,2,3).

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11. Find the transpose of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$

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12. Evaluate:

$$\int_0^{\pi/2} \log(\sin x)\,dx$$

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13. Let S be the set of all real numbers except 1 and 'o' be an operation on S defined by : aob = a+b - ab for all a,b $\in$ S. Prove that the given operation is : (I) commutative (II) associative.

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14. Let A=Set of all real numbes except 1. Let * be defined as

$a + b - ab$ for all $a, b \in A$.Show that * is associative

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15. Let A=Set of all real numbes except 1. Let 'cdot' be defined as a+b-ab for all a, $b \in A$ .Show that

0 is the identity element w.r.t. $\cdot$.

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16. Let A=Set of all real numbes except 1. Let 'cdot' be defined as a+b-ab for all a, $b \in A$ .Show that

Every element 'a' of A has an inverse $\frac{a}{1-a} \in A.$

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17. Prove that

$\cot^{-1} 7 + \cot^{-1} 8 + \cot^{-1} 18 = \cot^{-1} 3$

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18. Solve the following equations

$$\sin\left(\sin^{-1}\frac{1}{5}+\cos^{-1}x\right)=1$$

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19. Solve the following equations 5x-7y+z=11, 6x-8y-z=15, 3x+2y-6z=7 by Cramer's rule.

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20. Find $\frac{dy}{dx}$ if $x^y + y^x = a^b$

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21. If $f(x) = \begin{cases} \frac{x-5}{|x-5|} + a & , \text{if} \quad x < 5 \\ a + b & , \text{if} \quad x = 5 \\ \frac{x-5}{|x-5|} + b & , \text{if} \quad x > 5 \end{cases}$ is a continuous function, find 'a' and 'b'.

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22. Find the interval of increase and decrease of the function $f(x) = \log(1+x) - \dfrac{x}{1+x}$.

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23. Prove that the curves $x = y^2$ and $xy = k$ cut at right angles* if $8k^2 = 1$

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24. $\displaystyle\int \frac{\sin^{-1} x}{(1-x^2)^{3/2}} dx$

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25. Evaluate: $\int_0^{\pi} \sin x dx$.

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26. Sketch the graph of the function:

$$y = f(x) = \begin{cases} x & \text{if} \quad 0 \leq x \leq 1 \\ \frac{1}{x} & \text{if} \quad 1 < x < 2 \\ \frac{1}{2} & \text{if} \quad 2 \leq x \leq 3 \end{cases}$$

for x lying in [0,3]. Find the area bounded by this graph, x-axis and x=3.

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27. Solve the differential equation $\frac{d^2y}{dx^2} = x + \sin x$ given that when x=0, y=0, and $\frac{dy}{dx} = -1$.

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28. There is a group of 50 people who are patriotic out of which 20 believe in non-violence. Two persons are selected at random

out of them, write the probability distribution for the selected persons who are non-violent. Also find the mean of the distribution. Explain the importance of non-violence in patriotism.

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29. With the help of vector method, prove that,

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

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30. Experiments show that radium decomposes at a rate proportioanl to the amount of radium present at the moment. If its half life is 1570 years, what percentage will disappear in one years?

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31. The following matrix depicts the number of students of a school who were awarded for Discipline, Attendance and Obedience.

Discipline	Attendance	Obedience	
18	12	20	← girls
10	18	12	← boys

If the prize money for the three values were respectively Rs.500, Rs.200 and Rs.300, find the total prize money received by boys.

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32. The following matrix depicts the number of students of a school who were awarded for Discipline, Attendance and Obedience.

Discipline	Attendance	Obedience	
18	12	20	← girls
10	18	12	← boys

If the prize money for the three values were respectively Rs.500, Rs.200 and Rs.300, find who is more careful about the ethical values, boys or girls?

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33. The following matrix depicts the number of students of a school who were awarded for Discipline, Attendance and Obedience.

Discipline	Attendance	Obedience	
18	12	20	← girls
10	18	12	← boys

If the prize money for the three values were

respectively Rs.500, Rs.200 and Rs.300,

Name one more value for which prize can be give.

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34. A line with direction numbers <2,7,-5> is drawn to intersect the lines

$\frac{x-5}{3}=\frac{y-7}{-1}=\frac{z+2}{1}$ and $\frac{x+3}{-3}=\frac{y-3}{2}=\frac{z-6}{4}$.

find the coordinates of the points of intersection of the length intercept on it.

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35. Find x and y if the point $(x, -1, 3), (3, y, 1)$ and $(-1, 11, 9)$ are collinear. Also, write down the vector equation of the line in which they lie. Further, find the point of intersection of this line and the plane $x + y + z + 1 = 0$.

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36. find the mean and variance of the probability distribution of the sum of the numbers shown when a pair of fair dice is thrown once.

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37. The given quantity of metal is to be cost into a half cylinder with a rectangular base and semicircular ends. Show that in order that the total surface area may be minimum, the

ratio of the length of the cylinder to the diameter of its semi-circular ends is $\pi:(\pi+2)$.

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38. Compute $(AB)^{-1}$ where $A=\begin{bmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{bmatrix}$ and $B^{-1}=\begin{bmatrix}2 & 1 & 2\\ 2 & 2 & -1\\ 1 & 0 & 3\end{bmatrix}$

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39. Evaluate $\int_a^b x^2 dx$ as the limit of a sum.

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40. A diet for a sick person must contain atleast 4000 units of vitamin, 50 units of minerals and 1400 units of calories. Two foods A and B are available at a cost of Rs.5 and Rs.4 per unit respectively. One unit of food A contains 200 units of vitamin, 1 unit of minerals and 40 units of calories, while one

unit of food B contains 100 units of vitamins, 2 units of minerals and 40 units of calories. find what combination of food A and B should be used to have least cost, but it must satisfy the requirements of the sick person? form the question as an LPP and solve it graphically.

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