

## MATHS

# **BOOKS - ARIHANT PUBLICATION**

# **CHSE ODISHA EXAMINATION PAPER 2019**

Group A 10 Marks

1. If 
$$\phi(x)=f(x)+f(1-x),\,f^{\,\prime\,\prime}(x)=0\,\,\, ext{for}\,\,\,0\leq x\leq 1\,\,\, ext{,}$$
 then is  $\mathrm{x}\,=rac{1}{2}$  a point of maxima or minima of  $\phi(x)$  ?

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2. If f is an odd function, then write the value of
$$\int_{-a}^{a} \frac{f(\sin x)}{f(\cos x) + f(\sin^{2} x)} dx$$
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**3.** Write the order of the differential equation whose solution is given by

$$y = (c_1 + c_2) {
m cos}(x + c_3) + c_4 e^{x + c_5}$$

where  $c_1, c_2, c_3, c_4$  and  $c_5$  are arbitrary constants

**4.** If 
$$\overrightarrow{a} = \overrightarrow{b} + \overrightarrow{c}$$
, then write the value of  $\overrightarrow{a}$ .  $\left(\overrightarrow{b} \times \overrightarrow{c}\right)$ 

5. Write the value of k such that the line  $\frac{x-4}{1} = \frac{y-2}{1} = \frac{z-k}{2}$  lies on the plane 2x - 4y + z = 7

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**6.** A R is a relation on set A such that  $R = R^{-1}$ , then write the type of the relation R.



7. Write the value of 
$$\cos^{-1}\cos\left(\frac{3\pi}{2}\right)$$
.



then write the value of a.

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9. Let A and B be two mutually exclusive events such that

 $P(A)=rac{1}{2} \,\, {
m and} \,\, P(B)=rac{1}{3} \,\,$  . Write the value of  $P(A\cap B)$ 

10. If  $f'(2^+) = 0$  and  $f'(2^-) = 0$ , then is f(x)

continuous at x = 2 ?

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Group B 60 Marks

1. Prove that :

$$\cos^{-1} \left( rac{b + a \cos x}{a + b \cos x} 
ight)$$

`=2"tan"^(-1)(sqrt((a-b)/(a+b)) "tan" x/2)

**2.** Two types of food X and Y are mixed to prepare a mixture in such a way that the mixture contains at least 10 units of vitamin A, 12 units of vitamin B and 8 units of vitamin C. These vitamins are available in 1 kg of food as per the table given below

 $\begin{array}{c} \text{Vitamin} \\ \text{Food} \quad A \quad B \quad C \\ \text{X} \quad 1 \quad 2 \quad 3 \\ \text{Y} \quad 2 \quad 2 \quad 1 \end{array}$ 

1 kg of food X costs ₹ 16 and 1 kg of food Y costs ₹ 20 . Formulate the LPP so as to determine the least cost of the mixture containing the required amount of vitamins



**3.** Construct the multiplication table  $X_7$  on the set {1, 2, 3,

4, 5, 6}. Also find the inverse element of 4 if it exists.



**4.** Let R be the relation on the set R of real numbers such that aRb iff a-b is and integer. Test whether R is an equivalence relation. If so find the equivalence class of  $1 \text{ and } \frac{1}{2}$  wrt. This equivalence relation.

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5. Solve for 
$$x, 2 \tan^{-1}(\cos x) = \tan^{-1}(2 \operatorname{cosec} x)$$
.

6. Find the probability distribution of

number of heads in three tosses of a coin.

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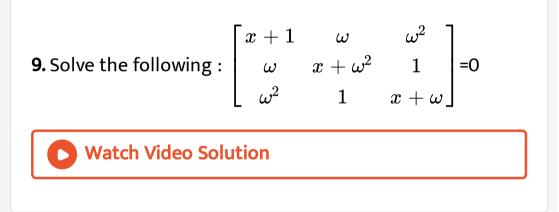
**7.** If 
$$A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 1 & 3 \\ -2 & 5 & 3 \end{bmatrix}$$
 then verify that A+A is symmetric

and A-A is skew-symmetric.



8. If 
$$A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$$
 then show that  $A^3 - 23A - 40I = O$ 

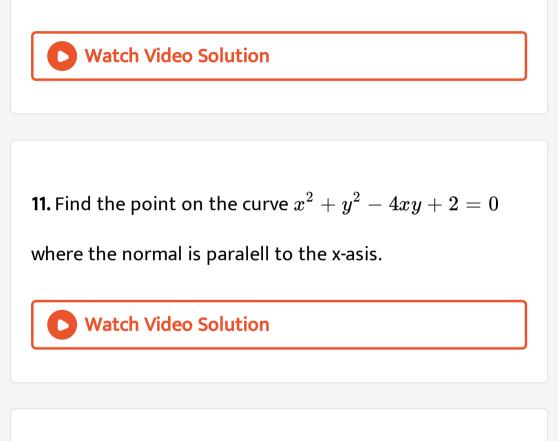
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**10.** A person takes 4 tests in succession. The probability of his passing the first test is p, that of his passing each succeeding test is p or  $\frac{p}{2}$  depending on his passing or failing the preceding test, Find the probability of his

passing

just three tests.



**12.** Find the intervals in which the function  $y = \frac{\ln x}{r}$  is

increasing and decreasing.

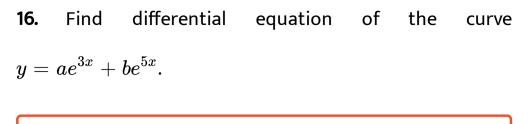


13. If 
$$y = e^{x^{e^{x^{e^x}}}}$$
, then find  $\frac{dy}{dx}$ .  
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14. Find  $\frac{d^2y}{dx^2}$  if x=a cos  $\theta$ ,  $y = b \sin \theta$ .

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15. Verify lagrange's Mean-Value theorem for

$$F(x) = x^3 - 2x^2 - x + 3$$
 on [1,2]



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17. Solve : 
$$ig(y^2+7y+12ig)dy+xdx=0$$

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18. Evaluate : 
$$\int rac{(2x+1)dx}{\left(\sqrt{x^2+x+4}
ight)}$$

19. Evaluate : 
$$\int_0^\pi rac{\cos x dx}{(2-\sin x)(3+\sin x)}$$



20. Find the area of the region bounded by the curve  $y = 6x - x^2$  and the x-axis.

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**21.** If  $l_1$ ,  $m_1$ ,  $n_1$  and  $l_2$ ,  $m_2$ ,  $n_2$  are the direction cosines of two mutually perpendicular lines show that the Direction Cosines of the line perpendicular to both of them are  $m_1n_2 - n_1m_2$ ,  $n_1l_2 - l_1n_2$ ,  $l_1m_2 - m_1l_2$  22. Find the point where the line  $\frac{x-2}{1} = \frac{y}{-1} = \frac{z-1}{2}$  meets the plane 2x + y + z = 2.

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23. Find a unit vector perpendicular to each of the vectors

$$ec{a}+ec{b}$$
 and  $ec{a}-ec{b}$ , where  $ec{a}=\hat{i}+\hat{j}+\hat{k}$  and  $ec{b}=\hat{i}+2\hat{j}+3\hat{k}.$ 

24. Prove that 
$$\left(\overrightarrow{a} \times \overrightarrow{b}\right)^2 = a^2b^2 - \left(\overrightarrow{a} \cdot \overrightarrow{b}\right)^2$$
.  
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25. Find the vector equation of a plane which is at a distance of 3 units from the origin ,  $2\hat{i} + 3\hat{j} - 6\hat{k}$  being a normal to the plane . Also get its cartesian equation



Group C 30 Marks

1. If 
$$e^{y/x} = \frac{x}{a+bx}$$
 then show that  $x^3 \frac{d}{dx} \left( \frac{dy}{dx} \right) = \left( x \frac{dy}{dx} - y \right)^2$  Watch Video Solution

2. Show that the shrtest distance of the point (0, 8a) from

the curve  $ax^2 = y^3$  is  $2a\sqrt{11}$ .



**3.** Determine the area common to the parabola  $y^2 = x$ and the circle  $x^2 + y^2 = 2x$ .

4. Find the solutions of the following differential equations :  $y^2 + x^2 \frac{dy}{dx} = xy \frac{dy}{dx}$ 

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**5.** Evaluate : 
$$\int \frac{dx}{2\cos^2 x}$$

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6. Show by vector method that the four points (6, 2, -1), (2,

-1, 3), (-1, 2, -4) and (-12, -1, -3) are coplanar.



7. Find the distance of the point (1, -1, -10) from the

line  $\frac{x-4}{1} = \frac{y+3}{-4} = \frac{z+1}{7}$  measured parallelto the line  $\frac{x+2}{2} = \frac{y-3}{-3} = \frac{z-4}{8}$ 

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8. If 
$$\sin^{-1}\Bigl(rac{x}{a}\Bigr)+\sin^{-1}\Bigl(rac{y}{b}\Bigr)=\sin^{-1}\Bigl(rac{c^2}{ab}\Bigr)$$
, then prove that  $b^2x^2+2xy\sqrt{a^2b^2-c^4}+a^2y^2=c^4$ 

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9. Solve the following LPP graphically :

Maximize  $Z=10x_1+12x_2+8x_3$ 

#### Subject to constraints

$$egin{array}{ll} x_1+2x_2&\leq 30\ 5x_1-7x_3&\geq 12\ x_1+x_2+x_3&=20\ x_1,\ x_2,\ x_3&\geq 0 \end{array}$$

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10. Prove that  $f\colon X o Y$  is injective iff for all subsets A, B

of  $X, f(A \cap B) = f(A) \cap f(B).$ 

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**11.** Examining consistency and solvability, solve the following equation by matrix method.

x-2y=3

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12. Out of the adult population in a village 50% are farmers, 30% do business and 20% are service holders. It is known that 10% of the farmers, 20% of the business holders and 50% of service holders are above poverty line. What is the probability that a member chosen from any one of the adult population, selected at random, is above poverty line?



**13.** Find the inverse of the following matrix using elementary transformation:  $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 1 & 0 & 2 \end{bmatrix}$