

# JKBOSE PATTERN TEST PAPER CLASS - XII SUBJECT MATHEMATICS



**ALLEN** Career Institute Pvt. Ltd.

**Registered & Corporate Office**

'SANKALP', CP-6, Indra Vihar, Kota (Rajasthan) INDIA-324005

Ph. : +91-744-3556677, +91-744-2757575 | E-mail : [info@allen.in](mailto:info@allen.in) | Website: [www.allen.ac.in](http://www.allen.ac.in)

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TIME : 3 Hours

MAX. MARKS : 80

Class: XII

Time Allowed: 3 Hours

Subject: Mathematics

**General Instructions:**

1. This Question paper contains - Four sections A, B, C and D. Each section is compulsory.
2. Section A-Question 1 to 10 comprises of 10 Very Very Short Answer type questions of 1 mark each
3. Section B-Question 11 to 20 comprises of 10 Very Short Answer (VSA)-type questions of 2 marks each.
4. Section C-Question 21 to 28 comprises of 8 Short Answer (SA)-type questions of 4 marks each.
5. Section D-Question 29 to 31 comprises of Long Answer (LA)-type questions of 6 marks each.

**(Section-A) Multiple Choice Type Questions**

**Q.1. Choose the correct option from the given alternatives and write it on your answer script.**

- a. Let  $f: R \rightarrow R$  be defined as  $f(x) = 3x$ . Choose the correct answer.
- i.  $f$  is one-one, onto
  - ii.  $f$  is many-one, onto
  - iii.  $f$  is one-one but not onto
  - iv.  $f$  is neither one-one nor onto
- b.  $\tan^{-1} \sqrt{3} - \sec^{-1}(-2)$  is equal to:
- |                      |                      |
|----------------------|----------------------|
| i. $\pi$             | iii. $\frac{\pi}{3}$ |
| ii. $\frac{-\pi}{3}$ | iv. $\frac{2\pi}{3}$ |
- c. If A, B are Symmetric Matrices of same order, then  $AB-BA$  is:
- |                          |                      |
|--------------------------|----------------------|
| i. Skew Symmetric Matrix | ii. Symmetric Matrix |
| iii. Zero Matrix         | iv. Identity Matrix  |

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d. Let 'A' be invertible matrix of order 2 then  $\det(A^{-1})$  is equal to :

- |                         |          |
|-------------------------|----------|
| i. $\det(A)$            | iii. 1   |
| ii. $\frac{1}{\det(A)}$ | iv. Zero |

e. The second order derivative of  $y = x^2 + 3x + 2$  is:

- |             |        |
|-------------|--------|
| i. $3 + 2x$ | iii. 3 |
| ii. 2       | iv. 0  |

f.  $\int \frac{dx}{\sin^2 x \cos^2 x}$  is equal to:

- |                          |                            |
|--------------------------|----------------------------|
| i. $\tan x + \cot x + c$ | iii. $\tan x - \cot x + c$ |
| ii. $\tan x \cot x + c$  | iv. $\tan x - \cot 2x + c$ |

g. The degree of differential equation

$$\left(\frac{d^2 y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + \sin\left(\frac{dy}{dx}\right) + 1 = 0 \text{ is}$$

- |       |                   |
|-------|-------------------|
| i. 3  | iii. 1            |
| ii. 2 | iv. None of these |

h. If "a" is a non zero vector of magnitude 'a' and  $\lambda$  is non zero scalar then  $\lambda a$  is unit vector if:

- |                    |                               |
|--------------------|-------------------------------|
| i. $\lambda = 1$   | iii. $a =  \lambda $          |
| ii. $\lambda = -1$ | iv. $a = \frac{1}{ \lambda }$ |

- i. Let the vectors  $\vec{a}$  and  $\vec{b}$  be such that  $|\vec{a}| = 3, |\vec{b}| = \frac{\sqrt{2}}{3}$   
 then  $\vec{a} \times \vec{b}$  is unit vector if the angle between  $\vec{a}$  and  $\vec{b}$  is:

- |                     |                      |
|---------------------|----------------------|
| i. $\frac{\pi}{6}$  | iii. $\frac{\pi}{3}$ |
| ii. $\frac{\pi}{4}$ | iv. $\frac{\pi}{2}$  |

- j. Probability that 'A' speaks truth is  $\frac{4}{5}$ . A coin is tossed 'A' reports that a head appears, the probability that actually there was head is:

- |                   |                    |
|-------------------|--------------------|
| i. $\frac{4}{5}$  | iii. $\frac{1}{5}$ |
| ii. $\frac{1}{2}$ | iv. $\frac{2}{5}$  |

(1×10=10)

(Section-B)

Very Short Answer Type Questions

- Q.2.** Show that  $f: R \rightarrow R$  defined by  $f(x) = \frac{1}{x}$  is one-one and onto.

- Q.3.** Find the principal value of  $\sin^{-1}\left(-\frac{1}{2}\right)$

- Q.4.** Evaluate the determinant  $\begin{vmatrix} 3 & -1 & -2 \\ 0 & 0 & -1 \\ 3 & -5 & 0 \end{vmatrix}$

TIME : 3 Hours

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**Q.5.** Prove that the function  $f(x) = 5x - 3$  is continuous at  $x=5$ .

**Q.6.** Find  $\frac{dy}{dx}$  of  $2x + 3y = \sin y$

**Q.7.** Find the rate of change of the area of a circle with respect to its radius 'r' when  $r=3\text{cm}$ .

**Q.8.** Integrate  $\int (ax + b)^2 dx$ .

**Q.9.** Integrate by using *ILATE Rule*  $\int x \sin x dx$ .

**Q.10.** Find the unit vector in the direction of the vector  $\vec{a} = \hat{i} + \hat{j} + 2\hat{k}$

**Q.11.** If a line makes angles  $90^\circ, 135^\circ, 45^\circ$  with the positive X, Y, Z axes respectively, find direction cosines.

(2×10=20)

(Section – C)

**Short Answer Type Questions**

**Q.12.** Define equivalence relation and show that the relation R in the set of real numbers defined by  $R = \{(a, b) : a \leq b^2\}$  is neither reflexive nor symmetric nor transitive.

TIME : 3 Hours

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**Q.13.** If  $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$  then verify,  $A^T \cdot A = I$ , where  $I$  is identity matrix

**Q.14.** Solve the linear programming problem graphically maximize  $Z = 3x + 4y$  subject to the constraints are  $x + y \leq 4$ ,  $x \geq 0$ ,  $y \geq 0$ .

**Q.15.** Find the maximum and minimum values if any of the following functions.

a.  $f(x) = (2x - 1)^2 + 3$

b.  $g(x) = x^3 + 1$

**Q.16.** Find the area of the region bounded by the ellipse  $\frac{x^2}{16} + \frac{y^2}{9} = 1$

**Q.17.** Find the angle between the vectors  $\hat{i} - 2\hat{j} + 3\hat{k}$  and  $3\hat{i} - 2\hat{j} + \hat{k}$

**Q.18.** Find the angle between the pair of lines

$$\vec{r} = 2\hat{i} - 5\hat{j} + \hat{k} + \pi (3\hat{i} + 2\hat{j} + 6\hat{k})$$

$$\text{and } \vec{r} = 7\hat{i} - 6\hat{k} + \mu (\hat{i} + 2\hat{j} + 6\hat{k})$$

**Q.19.** Differentiate w.r.t  $x$ ,  $y = (\log x)^{\cos x}$

**(4×8=32)**

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*(Section-D)**Long Answer Type Questions***Q.20.** Integrate:

a.  $\int \frac{2x}{1+x^2} dx$

b.  $\int \frac{(1 + \text{Log } x)^2}{x}$

*Or*

Using Property of Definite Integrals evaluate:

a.  $\int_0^{\frac{\pi}{2}} \cos^2 x dx$

b.  $\int_{-5}^5 |x + 2| dx$

**Q.21.** If  $P(A) = 0.8$ ,  $P(B) = 0.5$ ,  $P(B/A) = 0.4$ . Find:

a.  $P(A \cap B)$

b.  $P(A/B)$

c.  $P(A \cup B)$

*Or*

A bag contains 4 red and 4 black balls. Another bag contains 2 red and 6 black balls. One of the two bags is selected at random and a ball is drawn from the bag which is found to be red. Find the ball is drawn from the first bag.

**Q.22.** Find  $\frac{dy}{dx}$  if,

a.  $y = \sin^{-1} \left( \frac{2x}{1+x^2} \right)$

b.  $ax + by^2 = \cos y$

*Or*

Find the general solution of linear differential equation.

$$\frac{dy}{dx} + 2y = \sin x$$

(6×3=18)