

**ASSIGNMENT QUESTION DEC 2024 EXAMINATION**

**B.SC MATHS**

**SEMESTER I**

**NAME OF THE COURSE : Algebra & Trigonometry (JMMA11)**

1. a) Solve the equation  $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$ .

**(OR)**

b) The equation  $x^3 - 3x + 1 = 0$  has a root between 1 and 2. Calculate it to three places of decimal.

2. a) Find the Eigen vales and the Eigen vectors of the following matrices:

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

**(OR)**

b) Find the equation whose roots are  $2\cos\frac{2\pi}{7}, 2\cos\frac{4\pi}{7}, 2\cos\frac{6\pi}{7}$

**NAME OF THE COURSE : Differential Calculus (JMMA12)**

1.a) Find the  $n^{th}$  differential coefficient of  $\cos^5\theta \sin^7\theta$

**(OR)**

b) If  $x = \sin\theta, y = \cos p\theta$ , prove that  $(1 - x^2)y_2 - xy_1 + p^2y = 0$

2.a) If  $z = f(x, y)$  and  $x = r \cos\theta, y = r \sin\theta$ , prove that

$$\left(\frac{\partial z}{\partial x}\right)^2 + \left(\frac{\partial z}{\partial y}\right)^2 = \left(\frac{\partial z}{\partial r}\right)^2 + \frac{1}{r^2}\left(\frac{\partial z}{\partial \theta}\right)^2$$

**(OR)**

b) A tent having the form of a cylinder surmounted by a cone is to contain a given volume. If the canvass required is minimum, show that the altitude of the cone is twice that of the cylinder.

**ALLIED PHYSICS –I JEPH11**

1 (a) What is simple harmonic motion. Explain the composition of two SHM at right angles.

(OR)

(b) Describe the different types of elastic constants & Explain the principle behind bending of beam.

2 (a) What is a Heat engine? Explain Carno't's cycle with its efficiency?

(OR)

(b) State and prove Demorgan's Theorem.

**NAME OF THE COURSE : Mathematics for Competitive Examination – I  
(JSMA11)**

1. a) (i) Monika purchased a pressure cooker at  $\frac{9}{10}$  th of its selling price and sold it at 8% more than its S.P. Find her gain percent.

ii) A grocer purchased 80 kg of sugar at Rs 13.5 kg and mixed it with 120 kg sugar at Rs. 16 per kg. At what rate should he sell the mixture to gain 16%.

(OR)

b) i) A number consists of two digits. The sum of the digits is 9. If 63 is subtracted from the number, its digits are interchanged. Find the number.

ii) 50 is divided into two parts such that sum of their reciprocals is  $\frac{1}{12}$ . Find the two parts.

a) i) If  $x:y = 3:4$ , find  $(4x + 3y):(5x - 2y)$

ii) Divide Rs.672 in the ratio 5:3

(OR)

b) Divide Rs. 1162 among A, B, C in the ratio 35:28:20

**NAME OF THE COURSE : Bridge Mathematics (JFMA11)**

1. a) State and prove Binomial theorem

**(OR)**

b) A number of four different digits is formed with the use of the digits

1,2,3,4 and 5 in all possible ways. Find the following

i) How many such numbers can be formed?

ii) How many of these are even?

iii) How many of these are exactly divisible by 4?

2. a) Prove that  $\cos(\alpha + \beta) = \cos\alpha \cos\beta - \sin\alpha \sin\beta$

**(OR)**

b) Evaluate  $\int e^{ax} \cos bx \, dx$  using integration by parts

## SEMESTER II

**NAME OF THE COURSE : Analytical Geometry (Two & Three Dimensions)**  
**( JMMA21)**

1. a) Show that the conjugate lines through a focus of an ellipse at right angles.

**(OR)**

b) Trace the conic  $\frac{2}{r} = 1 + \cos \theta + \sin \theta$ .

2. a) Show that the origin lies in the acute angle between the planes  $x + 2y + 2z = 0$ ;  $4x - 3y + 12z + 13 = 0$ . Find the planes bisecting the angle between them and point out which bisects the obtuse angle.

**(OR)**

b) Prove that the lines  $\frac{x+1}{-3} = \frac{y+10}{8} = \frac{z-1}{2}$ ;  $\frac{x+3}{-4} = \frac{y+1}{7} = \frac{z-4}{1}$  are coplanar.

Find also their point of intersection and the plane through them.

**NAME OF THE COURSE : Integral Calculus (JMMA22)**

1. a) Solve the equation  $6x^5 - x^4 - 43x^3 + 43x^2 + x - 6 = 0$ .

**(OR)**

b) The equation  $x^3 - 3x + 1 = 0$ . has a root between 1 and 2. Calculate it to three places of decimal.

2. a) Find the Eigen vales and the Eigen vectors of the following matrices:

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

**(OR)**

b) Find the equation whose roots are  $2\cos\frac{2\pi}{7}$ ,  $2\cos\frac{4\pi}{7}$ ,  $2\cos\frac{6\pi}{7}$

**ALLIED PHYSICS –II JEPH21**

- 1 a) Define interference. Elaborate the principle of interference in thin films.

(OR)

- b) What is photo electric effect? Derive Einstein's photoelectric equation.

- 2 (a) Explain difference between nuclear fission and fusion process.

(OR)

- (b) Derive Length contraction, Time dialation and Mass –Energy equivalence..

**NAME OF THE COURSE : Mathematics for Competitive Examination-II  
(JSMA21)**

1. a) (i) What annual instalment will discharge a debt of Rs. 1092 due in 3 years at 12% simple interest?

- ii) A bank offers 5% compound interest calculated on half-yearly basis. A customer deposits Rs. 1600 each on 1<sup>st</sup> January and 1<sup>st</sup> July of a year. At the end of the year what will be the amount he would have gained by way of interest.

(OR)

- b) (i) A and B can do a piece of work in 18 days; B and C can do it in 24 days; A and C can do it in 36 days. In how many days will A,B and C finish it, working together and separately?

- (ii) A and B can do a piece of work in 72 days, B and C can do it in 120 days; A and C can do it in 90 days. In what time can A alone do it?

2. a) (i) While covering a distance of 24 km, a man noticed that after walking for 1 hour and 40 minutes, the distance covered by him was  $\frac{5}{7}$  of the remaining distance. What was his speed in meters per second?

(ii) If a certain number of workmen can do a piece of work in 25 hours, in how many hours will another set of an equal number of men, do a piece of work, twice as great, supposing that 2 men of the first set can do as much work in an hour, as 3 men of the second set do in an hour?

**(OR)**

b) (i) Pipe A can fill a tank in 30 hours and pipe B in 45 hours. If both the pipes are opened in an empty tank, how much time will they take to fill it?

(ii) Two pipes A and B can fill a tank in 12 minutes and 15 minutes respectively. If both the pipes are opened simultaneously and pipe A is closed after 3 minutes, then how much more time will it take to fill the tank by pipe B?

**NAME OF THE COURSE : LaTeX (JSMA22)**

1. a) Explain about comments and footnotes.

**(OR)**

b) Explain about text environments.

2. a) Explain about arithmetic operations.

**(OR)**

b) Explain about Math alphabets and symbols.

### SEMESTER III

**NAME OF THE COURSE : Vector Calculus and Applications**

**(JMMA31)**

1. a) Find  $\phi$  if  $\nabla\phi$  is  $(6xy + z^3)\vec{i} + (3x^2 - z)\vec{j} + (3xz^2 - y)\vec{k}$

**(OR)**

b) Find the equation of the tangent plane to the surface  $x^2 - 4y^2 + 3z^2 + 4 = 0$  at the point (3,2,1).

2. a) Show that  $\iint_S f \cdot n \, dS = \iiint_V a^2 \, dV$  where  $r = \phi a$  and  $a = \nabla\phi$  and  $\nabla^2\phi = 0$ .

**(OR)**

b) Show that  $\int_C (3x^2 - 8y^2)dx + (4y - 6xy)dy = 20$ , where C is the boundary of the rectangular area enclosed by the lines  $x=0, x=1, y=0, y=2$

**NAME OF THE COURSE : Differential Equations and Applications**

**(JMMA32)**

1. a) Solve  $(x^2 - yx^2)\frac{dy}{dx} + (y^2 + x^2y^2) = 0$ .

**(OR)**

b) Solve  $\frac{dy}{dx} = \frac{x+2y-3}{2x+y-3}$

2. a) Solve  $(y + z)p + (z + x)q = x + y$

**(OR)**

b) Solve  $p^2 + q^2 = npq$

**NAME OF THE COURSE : Statistics I (JEMA31)**

1. a) The first four moments of a distribution about  $x = 4$  are  $-1.5, 17, -30$  and  $108$ . Find the first four moments (i) about mean (ii) about the origin (iii) about  $x = 2$  (iv) Also calculate  $\beta_1$  and  $\beta_2$ .

**(OR)**

- b) Find the correlation coefficient for the following data.

$x$	10	12	18	24	23	27
$y$	13	18	12	25	30	10

2. a) Calculate the rank correlation coefficient for the following data.

$x$	33	56	50	65	44	38	44	50	15	26
$y$	50	35	70	25	35	58	75	60	55	26

**(OR)**

- b) Fit a straight line to the following data regarding  $x$  as the independent variable.

$x$	0	1	2	3	4
$y$	1	1.8	3.3	4.5	6.3

**NAME OF THE COURSE : Computational Mathematics (JSMA31)**

1. a) Find the positive real root of  $x \log_{10} x = 1.2$  using bisection method in four iterations.

**(OR)**

- b) Find the negative root of  $x^3 - 2x + 5 = 0$  correct to three places of decimals by the Newton – Raphson method

2. a) Solve the following system of equations by Gauss Jordan Method

$$5x - 2y + 3z = 18$$

$$x + 7y - 3z = -22$$

$$2x - y + 6z = 22$$

**(OR)**



b) Solve  $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$  in  $0 \leq x \leq 4; 0 \leq y \leq 4$  given that  $u(0,y) = 0$ ;

$$u(4,y) = 8+2y; u(x,0) = \frac{x^2}{2}; u(x,4) = x^2 \text{ with } \Delta x = \Delta y = 1$$

**NAME OF THE COURSE : Mathematics for Competitive Examination – III**  
**(JNMA31)**

1. a) (i) Find the square root of 1471369.

(ii) Find the sum:  $3 + \frac{1}{\sqrt{3}} + \frac{1}{3+\sqrt{3}} + \frac{1}{3-\sqrt{3}}$

**(OR)**

b) (i) A train travelling with constant speed crosses a 90 m long platform in 12 seconds and a 120 m long platform in 15 seconds. Find the length of the train and its speed.

(ii) The age of father 10 years ago was thrice the age of his son. 10 years hence father's age will be twice that of his son. Find the ratio of their present ages.

2. a) (i) A lawn is in the form of a rectangle having its sides in the ratio 2 : 3. The area of the lawn is 16 hectares. Find the length and breadth of the lawn.

(ii) If the diagonal of a square is decreased by 15%, find the percentage decrease in its area.

**(OR)**

b) (i) If each edge of a cube is increased by 50%, find the percentage increase in its surface area.

(ii) If the radius of a sphere is increased by 50%, find the increase percent in volume and the increase percent in the surface area.