



# JAIN COLLEGE

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Rajarajeshwari Nagar, Bangalore - 560 098

**SUBJECT: Basic Maths**

**IIPUC**

**MOCK II**

**Timings Allowed: 3 Hrs 15 Minutes**

**Total Marks: 100**

**Instructions: i) The question paper has 5 parts. A,B,C,D,E. Answer all the parts.**

**ii) Part A carries 10 marks. Part B carries 20 marks, Part C and Part D carries 30 marks**

**and Part E carries 10 marks.**

**iii) Write the question number properly as indicated in the question paper.**

## PART A

### I ANSWER ANY TEN

**1X10=10**

- Without expansion Evaluate  $\frac{4000}{4006} \frac{4003}{4009}$
- If  $nC_4 = nC_5$ , Find 'n'
- Write symbolically "If two lines intersect, then they are not parallel lines"
- Find mean proportion of 36 and 4
- Define yield?
- If  $\sin A = \frac{1}{2}$ , Find  $\cos 2A$
- Find equation of unit circle with center at (4,-3)
- Evaluate  $\lim_{x \rightarrow 2} \frac{x^2 - 2^2}{x - 2}$
- Find  $\frac{dy}{dx}$ , if  $y = \sqrt[5]{x}$
- Evaluate  $\int a^{3x} dx$

## PART B

### II ANSWER ANY TEN

**2X10=20**

- If  $\frac{x - y}{4} = \frac{3}{x + y} = \frac{0}{4} = \frac{3}{3}$ , Find x, y
- There are 15 points in a plane of which 3 are collinear. Find the number of straight lines that can be drawn?
- In a single throw of two dice, What is the probability of obtaining a total of 9?
- If p is T, q is F, Find the truth value of  $\sim(p \rightarrow q) \vee \sim p$
- Two numbers are in the ratio 3:5. If 5 is added to each term, their ratio becomes 2:3. Find the numbers
- Find the bankers discount on Rs.1000 due 6 months hence at 10%p.a.
- Ananya bought a coat at Rs.220 inclusive of sales tax 10%. How much was the sales tax?
- If  $\tan A = \frac{1}{2}$ ,  $\tan B = \frac{1}{3}$ , Prove that  $A + B = \pi/4$
- Find focus and directrix of the parabola  $x^2 = 16y$
- Evaluate  $\lim_{x \rightarrow 0} \frac{\tan 3x}{\sin 5x}$
- If  $y = x^{\log x}$ , Find  $\frac{dy}{dx}$

22. Find a point on the parabola  $y^2=18x$  at which ordinate increases as twice as the rate of the abscissa
23. Find two positive numbers whose sum is 16 and sum of squares of the numbers is minimum
24. Evaluate  $\int (4x^2 - 2x + 7)^{3/2} (4x - 1) dx$

**PART C**

**III ANSWER ANY TEN**

**3X10=30**

25. Show that in a determinant scalar multiple of the element of any row or column is added to any other row or column, the value of the determinant remains the same
26. Using properties of determinants prove that 
$$\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} = 1+a+b+c$$
27. Prove that  $nC_r + nC_{r-1} = n+1C_r$
28. In a class of 80 students 40 take Maths, 25 take statistics. If each student has taken atleast one of these subject, Find the probability that the student takes (i) both Math and Statistics (ii) only Math (iii) only Stats
29. Two quantities are in the ratio 3:4. If 10 is subtracted from each of them, the remainder are in the ratio 1:3. Find the quantities
30. Calculate the banker's discount on the face value of Rs.10000 if the period is 73 days at 5% p.a., bankers commission
31. Find the interest earned on Rs.4897.5 cash invested in 15% stock at 81.50, given brokerage is 0.125%
32. If  $y = \tan x + \tan x + \tan x \dots \dots \dots \infty$ . Find  $\frac{dy}{dx}$
33. Find the coordinates of the vertex, focus, directrix of the parabola  $5x^2+24y=0$
34. If  $x=a \sec \theta, y=b \tan \theta$ , Find  $\frac{dy}{dx}$   $\theta = \pi/4$
35. A circular plate of metal is heated so that its radius increases at the rate of 0.1mm/min. At what rate is the plate's area increasing when radius is 25cm
36. Find the maximum and minimum value of the function  $f(x)=x^5+5x^3-1$
37. Evaluate  $\int \frac{4x+3}{x-1} dx$
38. Evaluate  $\int_0^{\pi/2} \sin 5x \cdot \cos 3x dx$

**PART D**

**IV ANSWER ANY SIX**

**5X6=30**

39. Find the middle terms in the expansion of  $(x - \frac{4}{x^2})^{11}$
40. Resolve into partial fractions  $\frac{2x+1}{x-1} \frac{1}{x-2} \frac{1}{x-3}$
41. Verify  $\sim(p \rightarrow q) \vee [(\sim p \wedge q) \leftrightarrow \sim q]$  is a Tautology, Contradiction or neither
42. Rs.5625 is divided among A,B,C so that A receives one half as much as B and C together receive and B one fourth of what A and C together receive. Find the share of A,B,C
43. A company supplies water tanker to government, the water tanker takes 20,000 labour hours. The government auditors suggests that there should be 90% learning effect rate the

management expects an order of 8 water tankers in the next year. what will be the total labour cost the company will incur at then rate of Rs.20 per hour

44. Solve the following LPP graphically Maximize  $Z=60x+15y$ ,subjected to constraints  $x+y\leq 50, 3x+y\leq 90$ , and  $x,y\geq 0$
45. Prove that  $\sin 3A=3\sin A-4\sin^3 A$
46. A circle passes through the points  $(0,0),(1,1)$  and has its centre on x-axis.Find its equation.
47. If  $y=x+\sqrt{x^2-1}$ . Prove that  $(x^2-1)y_2+xy_1-y=0$
48. Find the area enclosed by  $y^2=x$  and the line  $x+y=2$

### PART E

**V ANSWER ANY ONE**

**1X10=10**

49. (a) Evaluate  $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ . Hence deduce  $\lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta} = 1$   
(b) Find total revenue obtained by raising the output from 10 to 20 units where the marginal revenue function is given by  $MR=3\frac{x^2}{20} - 10x + 100$  (x is output)
50. (a) Show that the points are concyclic  $(0,0),(1,1),(5,-5),(6,-4)$   
(b) The angle of elevation of an object from a point 100m above a lake is  $30^\circ$  and angle of depression of its image in the lake is  $45^\circ$ . Find the height of the object above the lake

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