Jain College, Jayanagar
II PUC Mock Paper - I
Basic Maths

Duration: 3.15 minutes **Max. Marks: 100**

PART-A

I. Answer all questions: $1 \times 10 = 10$

1. If $A = [3 \quad -2 \quad 5]$. $Find\ AA'$.
2. If $5_{p_r} = 60$ find the value of r.
3. Write symbolically "If oxygen is a gas then gold is a compound".
4. Find the mean proportion of $\frac{1}{16}$ and $\frac{1}{25}$.
5. Define "Index of Learning".
6. If $\cos A = \frac{\sqrt{3}}{2}, Find \cos 2A.$
7. If the radius of the circle $x^2 + y^2 + 4x - 2y - k = 0$.
8. Evaluate: $\lim_{x \to \frac{1}{2}} \frac{4x^2-1}{2x-1}$.
9. Find $\frac{dy}{dx}$ if $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1.$
10. Integrate: 7^{3x+4}.

PART-B

II. Answer any 10 questions: $2 \times 10 = 20$

11. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ Show that $A^2 - 5A = 2I.$
12. In how many ways can 9 boys and 6 girls be seated in a row, if no two girls are together.
13. Student A can solve 35% of the problem. Student B can solve 80% of the problem. Find the probability that the problem is not solved, if they try independently.
14. Write Inverse and contrapositive of "if oxygen is a gas then accountancy is easy or the child is brave"
15. What must be added to each term in the ratio 6:5 so that it becomes 8:9.
16. Find the true discount on Rs.1380, due $1\frac{1}{2}$ year after, at 10% p.a.
17. The price of a washing machine of sales tax is Rs.13530. If the sales tax is 10%. Find the basic price.
18. Prove that $\frac{\cos 2A - \cos 12A}{\sin 12A - \sin 2A} = \tan 7A.$
19. If $y = -4$ is the equation of a directrix, axis $x = 3$ and length of the latus rectum is 8. Find the equation of the parabola.
20. Evaluate: $\lim_{x \to 0} \left(\frac{3^x - 2^x}{x}\right)$.
21. If $x = a \sec\theta, y = b \tan\theta, find\ \frac{dy}{dx}$.
22. The radius of a circular plate is increasing at the rate of $\frac{2}{3\pi}$cm/sec. Find the rate of change of its area when the radius is 6cm.

23. Evaluate: $\int \frac{1}{x(3+\log x)}\,dx$

24. Evaluate: $\int \cos 5x.\cos 3x\,dx.$

PART-C

III. Answer any 10 questions: $10 \times 3 = 30$

25. Solve using Cramer's rule: $3x + 4y = 7\ and\ 7x = y + 6.$

26. Using properties of determinants, prove

$$\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} = 1 + a + b + c.$$

27. Find the number of permutations of the letters of the word 'COMMISSION' if the word

i) start with M and end with M
ii) 2S's are together
iii) 2O's are not together

28. Probability that A solves the given problem is $\frac{1}{2}$ and probability that B solves the given problem is $\frac{1}{4}$.

If the problem is independently tried by them. What is the probability that:
a) the problem is solved
b) both do not solve the problem
c) B alone solves the problem

29. The ratio of prices of two houses was 16:23. Two years later when the price of the first had risen by 10% and that of second by Rs.477, the ratio of their prices becomes 11:20. Find the original prices of the two houses.

30. A bill of Rs.5000 drawn on 10-04-1998 at 3 months was discounted in 1-05-1998at 12%p.a. For what sum was the bill discounted and how much has the banker gained in this transaction.

31. What Is the market value of 6% stock if it earns an interest of 4.5% after deducting the income tax of 4%.

32. The owner of a departmental store purchased an article of Rs.1500 at 4% VAT and sells it at Rs.1700 to the customer at 4% VAT. How much amount did the shopkeeper deposit to the government as VAT.

33. Find the focus , equation of directrix and co-ordinates of the latus rectum of the parabola $x^2 = -8y.$

34. Differentiate $\sqrt{\frac{(x-1)(x-2)}{(x-3)(x-4)(x-5)}}$ w.r.t.x

35. Find the minimum value of $x^2 + \frac{250}{x}$.

36. Differentiate $sinx$ w.r.t x by first principles.

37. Evaluate: $\int \frac{1}{1+\cos x}\,dx.$

38. Evaluate: $\int \frac{dx}{x[(\log x)^2 - 3\log x + 2]}$

PART-D

IV. Answer any six questions: $6 \times 5 = 30$

39. Find the middle term in the expansion of $\left(\sqrt{x} - \frac{4}{x^2}\right)^{11}$.
40. Resolve into partial fractions: $\frac{1+3x+2x^2}{(1-2x)(1-x^2)}$.
41. Show that $(\sim p \wedge q) \wedge (q \wedge r) \wedge (\sim q)$ is a contradiction.
42. A jar contains two liquids A and B in the ratio 7:5 when 9 liters of the mixture is drawn and the jar is filled with the same quantity of B, the ratio of A and B becomes 7:9. Find the quantity of A in the jar initially.
43. An engineering company has 80% learning effect and spends 1000 hours to produce 1 lot of the product. Estimate the labour cost of producing 8 lots of the product if the labour cost is Rs.40 per hour.
44. A person is at the top of a tower 75 feet high, from there he observes a vertical pole and finds the angles of depressions of the top and bottom of the pole which are $30°$ and $60°$ respectively. Find the height of the pole.
45. In a triangle ABC, prove that $\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \cos C$.
46. Solve LPP graphically, Maximize $Z = 4x + 3y$ subject to the constraints
    $x + 2y \leq 5; x + y \leq 3, 3x + y \leq 7; x, y \geq 0$.
47. If $y = x + \sqrt{x^2 - 1}$ prove that $(x^2 - 1)y_2 + xy_1 - y = 0$.
48. Find the area enclosed between the parabola $y^2 = x$ and the line $x + y = 2$.

PART-E

V Answer any one of the following: $1 \times 10 = 10$

49. a) Prove that $\lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1, \theta$ is in radians and hence deduce $\lim_{\theta \to 0} \frac{\tan \theta}{\theta} = 1$.

    b) Find the total revenue obtained by raising the output from 10 to 20 units. Where the marginal revenue function is given by $MR = 3\left(\frac{x^2}{20}\right) - 10x + 100$(x=output).

50. a) Show that the points $(2,-4), (0,0), (3,-1) and\ (3,-3)$ are concyclic.

    b) A producer has 30 and 17 units of labour and capital respectively which he can use to produce two types of goods A and B. To produce one unit of A, 2 units of labour and 3units of capital are required similarly 3 units of labour and 1 unit of capital is required to produce 1 unit of B. If A and B are priced at Rs.100 and Rs.120 per unit respectively. How should he use his resources to maximize the total revenue? Form an LPP to maximize his revenue.

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