Jain College, Jayanagar
II PUC Mock Paper I 2018
SUBJECT: Basic Maths

Duration: 3hr 15 min **Max.Marks: 100**

PART A

I. Answer all the questions: **1 × 10 = 10**

1. Find x, if $\begin{vmatrix} 4 & x \\ x & 16 \end{vmatrix} = 0$
2. If ${}^{n}C_{8} = {}^{n}C_{7}$, find n.
3. Negate: If 4 is not an odd number, then 7 is a prime number.
4. Find the value of x if 32 : x = 75 : 50.
5. What income can be obtained from Rs 8000 of 4% stock?
6. Find the value of sin70°cos20° + cos70°sin20°.
7. Find the equation of the point circle with centre at (4, -3)
8. Evaluate: $\lim_{x \to 4} \left[\frac{x^3 + 4}{1 - x} \right]$
9. Find $\frac{dy}{dx}$ if $\sqrt{x} + \sqrt{y} = \sqrt{a}$
10. Evaluate: $\int \frac{x dx}{x^2 + 4}$

PART B

II. Answer any 10 questions: **10 × 2 = 20**

11. If $\begin{bmatrix} 2 & -1 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ 2 \end{bmatrix}$. Find x and y.
12. In howmany ways can 3 boys and 4 girls be arranged in a row so that no 2 boys sit together.
13. Two cards are drawn from a well shuffled pack of playing cards find the probability that both are same colour.
14. Write the inverse and contrapositive of “if oxygen is a gas then accountancy is easy or the child is brave”.
15. If a : b = 4 : 5, find $\frac{3a + 2b}{3a - 2b}$
16. Find the present value of Rs 750 due 4 months hence at 15% p.a.
17. Find the value of tan 15°
18. Prove that $\sin 2A = \frac{2 \tan A}{1 + \tan^2 A}$
19. If $y^2 = 16x$ find (i) focus (ii) latus rectum of the parabola.
20. Evaluate: $\lim_{\theta \to 0} \frac{\tan 5\theta . \sin^2 \theta}{\theta^3}$
21. If $y = \log\left(\frac{1 - \cos x}{1 + \cos x} \right)$. Find $\frac{dy}{dx}$
22. The demand function of a firm is 2x – 5y = 7 (x is the output, y is price/unit). Find the marginal revenue.
23. Evaluate $\int \frac{1}{\sqrt{x} - x} dx$

24. Evaluate $\int_1^2 (x^2 + e^x)dx$

PART C

III. Answer any 10 questions: 10 × 3 = 30

25. If $2A + B = \begin{bmatrix} 3 & -1 \\ -2 & 5 \end{bmatrix}$ & $A - 2B = \begin{bmatrix} 4 & 2 \\ -1 & 5 \end{bmatrix}$ then find A and B.
26. Prove that "If each element of any row (or column) of a determinant is the sum of two terms, then the determinant can be expressed as the sum of two determinants".
27. A box contains 5 red, 4 black and 3 white balls. How many selections of 8 balls can be made if the selection contains
    (i) Exactly 4 red, 2 black and 2 white balls
    (ii) Atleast 3red, atleast 3 black and atleast 1 white balls.
28. Two dice are thrown at once, what is the probability of getting face upwards with
    a) Sum equal to 4 or 5
    b) Sum is multiple of 4 or 6.
29. Three numbers are in the ratio 2:3:4. If the sum of their squares is 1856, find the numbers.
30. A bill for Rs 12900 was drawn on 3 Feb 2004 at 6 months and discounted on 13 march 2004 at 8% p.a. For what sum was the bill discounted and how much did the banker gain in this transaction?
31. Sukanya holds Rs 8000 of 3% stock. She sells it at Rs 110 and invests the proceeds in 5% stock, thereby her income increases by Rs 260. Find the market price of 5% stock.
32. A shopkeeper buys a mobile set at a discount of 20% from the wholesaler, the printed price of the mobile set being Rs 1,600 and the rate of sales tax is 6%. The shopkeeper sells it to the buyer at the printed price and charges tax at the same rate.
33. Find the equation of the parabola whose focus is (0, -4) and directrix is y = 4. Also find the equation of the tangent.
34. Differentiate sinx with respect to x from first principles.
35. Find the two positive numbers whose sum is 14 and the sum of whose square is minimum.
36. A ladder 17 feet long leans against a smooth vertical wall. If the lower end is moving at the rate of 2 ft min. Find the rate at which the upper end is moving when the lower end is 8 ft from the wall.
37. Evaluate $\int \frac{4x+5}{(x-1)(x+2)}dx$
38. Evaluate: $\int_0^{\pi/2} \frac{1+\cos 2x}{1-\cos 2x}dx$

PART D

IV. Answer any 6 questions: 6 × 5 = 30

39. Find the middle terms in the expansion of $\left(2x - \frac{1}{x}\right)^{17}$
40. Resolve $\frac{2x+1}{(x-1)(x+2)(3x-1)}$ into partial fractions.
41. Prove that $\sim (p \leftrightarrow q) \equiv (p \wedge \sim q) \vee (q \wedge \sim p)$
42. Two tape can fill a tank separately in 24 minutes and 40 minutes respectively and a drain pipe can drain off 30 liters per minute. If all the three pipes are opened the tank fills in 60 minutes. What is the capacity of the tank.

43. An aircraft manufacturer supplies aircraft engines to different airlines. They have just completed an initial order for 30 engines involving a total of 6000 labour hours at Rs 20/hour.
    They have been asked to bid for a prospective contract for a supply of 90 engines. It is expected that there will be 80% of learning effect. Estimate the labour cost for the new order.
44. Solve the following LPP graphically maximize Z = 60x + 15y subject to the constraints
    $x + y \leq 50,\ 3x + y \leq 90,\ x \geq 0, y \geq 0$
45. The angle of elevations of the top of an unfinished tower at a point, distance 120m from its base is 45°. How much higher must the tower be raised so that the angle of elevation at the same point is 60°
46. A circle has its centre on x-axis and passes through (5, 1) and (3, 4). Find its equation.
47. If $x^2 - xy + y^2 = a^2$, show that $\frac{d^2y}{dx^2} = \frac{6a^2}{(x-2y)^3}$
48. Find the area of the region between the parabolas $y^2 = 4ax$ and $x^2 = 4ay$.

PART E

V. Answer any 1 question: 1 × 10 = 10

49. a) A school wants to award its students for the values of punctuality, good behaviour, hardwork with a total cash awards Rs 6000. Three times the award money for hardwork added to that given for punctuality amounts to Rs 11,000. The award money for punctuality, and hardwork together is double the one given for good behaviour. Represent the above situation algebraically and also find the award money for each value, using matrix method.
    b) Find the value of $(0.98)^5$ using binomial theorem upto 5 places of decimals.
50. a) Evaluate: $\lim_{x \to a} \frac{x^n - a^n}{x - a} = n.a^{n-1}$ for all rationals n is positive, negative and fraction.
    b) Find the total revenue obtained by raising the output from 10 to 20 units where the marginal revenue function is given by $MR = 3\left(x^2 \big/ 20\right) - 10x + 100 (x = output)$

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