

**SHARADA P.U COLLEGE, MANGALURU**  
**II PU BASIC MATHS**

MAX. MARKS: 100

Time: 3 HOUR

- Instruction:** i) There are 5 parts in the question paper namely A, B, C, D and E.  
ii) Answer all the parts.  
iii) Write the question numbers properly.

**Part - A**

**I. Answer all the questions:**

**10 X 1 = 10**

1. Evaluate  $\begin{vmatrix} 3200 & 3201 \\ 3202 & 3203 \end{vmatrix}$
2. How many straight lines can be formed from 10 points if no three of them are collinear?
3. Write the contrapositive of the proposition "If  $x(x - 2) = 0$  then  $x = 2$ ".
4. Find the fourth proportional to 6, 12, 15.
5. How much stock at 75 can be bought for Rs. 3, 375?
6. If  $\tan A = \frac{1}{2}$ ,  $\tan B = \frac{1}{3}$ , then find  $\tan(A + B)$ .
7. Find the coordinates of the focus of the parabola  $y^2 + 4x = 0$ .
8. Evaluate:  $\lim_{x \rightarrow 0} \frac{\sin 4x}{\sin 2x}$ .
9. If  $y = e^x + x^e + e^e$ , find  $\frac{dy}{dx}$ .
10. Evaluate:  $\int \frac{1}{7x+8} dx$ .

**Part - B**

**II. Answer any Ten questions:**

**10 X 2 = 20**

11. Solve by Cramer's rule:  $2x + 5y = 1$ ,  
 $3x + 2y = 7$
12. In how many ways can 6 gentlemen and 4 ladies be seated around a table so that no 2 ladies are together?
13. A bag contains 5 red, 7 yellow and 8 green marbles. 3 marbles are drawn randomly from the bag. What is the probability that all the 3 are red?
14. If the compound proposition  $p \rightarrow (\sim q \vee r)$  is false, then find the truth values of p, q and r.
15. If 10 persons can do a job in 60 days, then in how many days can 20 persons do the same job?
16. True discount on a bill was Rs. 100 and Banker's gain was Rs. 10. What is the face value of the bill?
17. Prove that:  $\frac{\cos 2A}{1 + \sin 2A} = \frac{\cos A - \sin A}{\cos A + \sin A}$ .
18. If  $\sin A = \frac{3}{5}$ ,  $\cos B = -\frac{8}{17}$ ,  $\frac{\pi}{2} < A < \pi$  and  $\frac{\pi}{2} < B < \pi$ , find the value of  $\sin(A - B)$ .
19. Find the length of the chord of the circle  $2x^2 + 2y^2 + 6x - 2y - 12 = 0$  intercepted by the y-axis.
20. Find k if the function  $f(x) = \begin{cases} (1+2x)^{\frac{1}{x}}, & x \neq 0 \\ k, & x = 0 \end{cases}$  is continuous at  $x = 0$ .
21. Find  $\frac{dy}{dx}$  if  $x^y = y^x$ .

22. If  $s = 5t^2 + 4t - 8$ , find the initial velocity and acceleration. ( $s$  = displacement,  $t$  = time taken).
23. Evaluate:  $\int \frac{\sec^2 x \cdot \tan x}{3 + \sec^2 x} dx$ .
24. If the marginal cost of a firm is  $10 + 6x - 6x^2$  where  $x$  is the output, find the total cost given that the fixed cost is Rs. 125.

**Part – C**

**III. Answer any Ten questions:**

**10 X 3 = 30**

25. If  $A = \begin{bmatrix} 2 & 3 \\ -4 & 1 \end{bmatrix}$ ,  $B = \begin{bmatrix} -1 & 5 \\ 6 & 2 \end{bmatrix}$ , then show that  $(AB)' = B'A'$ .
26. Prove that  $\begin{vmatrix} a-2b-2c & 3b & 3c \\ 3a & b-2c-2a & 3c \\ 3a & 3b & c-2a-2b \end{vmatrix} = 4(a+b+c)^3$
27. An examination paper consists of 12 questions divided into parts A and B. Part A has 7 questions and Part B has 5 questions. A candidate is required to answer 8 questions, selecting at least 3 from each part. In how many ways can the candidate select the questions?
28. The probability that India wins a cricket test against Australia is  $\frac{1}{3}$ . If India and Australia play 3 tests, what is the probability that  
 a) India loses all 3 tests  
 b) India wins all 3 tests and  
 c) India wins at least one test.
29. If Rs. 120 maintain a family of 4 people for 30 days, how long Rs. 300 maintain a family of 6 people?
30. A bill for Rs. 3,500 due for 3 months was drawn on 27 March 2015 and was discounted on 18 April 2015, at the rate of 7% p.a. Find the Banker's Discount and discounted value of the bill.
31. A person has invested Rs. 4,300 partly in 4.5% stock at Rs. 72 and partly in 5% stock at Rs. 95. If the total income from both is Rs. 250, find the investment in both the types of stocks.
32. An owner of a departmental store purchased an article of Rs. 1,500 at 4% VAT and sells it at Rs. 1,700 to the customer at 4% VAT. How much did the shopkeeper deposit to the Government as VAT? What is the total amount paid by the customer?
33. Find the equation of the parabola whose vertex is (0, 0), axis is y-axis and passing through the point (3, -4).
34. If  $x = a \cos(\log t)$ ,  $y = a \log(\cos t)$ , find  $\frac{dy}{dx}$ .
35. A ladder 15 ft. leans against a smooth vertical wall. If the top slides downwards at the rate of 2 ft/sec, find how fast the lower end is moving when the lower end is 12 ft. away from the wall?
36. Find the maximum and minimum values of the function  $f(x) = 2x^3 - 3x^2 - 12x + 12$ .
37. Evaluate:  $\int x^3 \cdot \log x dx$ .
38. Evaluate:  $\int_1^2 \frac{2x+5}{(x^2+5x+3)^2} dx$ .

**Part – D**

**IV. Answer any Six questions:**

**6 X 5 = 30**

39. Solve by matrix method:  
 $3x + y + 2z = 3$   
 $2x - 3y - z = -3$   
 $x + 2y + z = 4$
40. Find the term independent of  $x$  in the expansion of  $\left(\sqrt{x} - \frac{2}{x}\right)^{21}$ .
41. Resolve into partial fractions:  $\frac{1+2x}{(x+2)^2(x-1)}$
42. Prove that  $(p \vee q) \wedge (\sim p \wedge \sim q)$  is a contradiction.
43. The monthly incomes of A and B are in the ratio 9 : 7 and that of B and C are in the ratio 3 : 2. If 10% of A's income and 15% of C's income differ by Rs. 18, then find the incomes of A, B and C.
44. A company requires 200 hours to produce the first 10 units at Rs. 10 per hour. If the learning effect is 90%, find the total labour hours to produce 160 units and also the total labour cost.
45. Solve the following L.P.P. graphically:  
Maximize:  $Z = 6x + 8y$   
Subject to the constraints:  
 $4x + 2y \leq 20$   
 $2x + 5y \leq 24$   
and  $x \geq 0, y \geq 0$ .
46. The angles of elevation of the top of a tower from the base and top of a building are  $60^\circ$  and  $45^\circ$  respectively. If the building is 20 m. High, then find the height of the tower.
47. If  $xy + 6y = 2x$ , then show that  $\frac{d^2y}{dx^2} = \frac{-24}{(x+6)^3}$ .
48. Find the area enclosed between the curves  $y^2 = x$  and  $x^2 = y$ .

**Part – E**

**V. Answer any One question:**

**1 X 10 = 10**

49. a) Prove that  $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n \cdot a^{n-1}$  for all values of  $n$ . **(6)**  
b) Find the value of  $(0.99)^4$  upto 4 decimal places, using Binomial Theorem. **(4)**
50. a) Show that the points  $(0, 0)$ ,  $(1, 1)$ ,  $(5, -5)$  and  $(6, -4)$  are concyclic. **(6)**  
b) A furniture maker has 6 units of wood and 28 hours of free time in which he will make decorative screens. He estimates that each of model 1 requires 2 units of wood and 7 hours of free time. Each of model 2 needs 1 unit of wood and 8 hours of free time. The prices of the models are Rs. 120 and Rs. 80 respectively. Formulate the LPP to determine how many screens of each type should be assembled so as to maximize his sales revenue. **(4)**