SRI BHAGAWAN MAHAVEER JAIN COLLEGE Vishweshwarapuram, Bangalore. **Mock Question Paper 2 –** January 2020	**Course:** II year PUC **Subject:** Basic Mathematics **Max. Marks:** 100 **Duration:** 3.15hrs.

Instructions

(i) The question paper has 5 parts A, B, C, D and E. Answer all the parts.

(ii) part A-Carries 10 marks, part B-carries 20 marks, part C-Carries 30 marks, 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 ALL the questions. **10x1=10**

1. Without actual expansion evaluate
$$\begin{vmatrix} 8 & 2 & 1 \\ 12 & 3 & -5 \\ 16 & 4 & 2 \end{vmatrix}$$
2. In how many ways can 9 flowers of different colours be strung together to form a garland
3. Write the contrapositive of "If $x \in A \cap B$ then $x \in A$ *or* $x \in B$"
4. Find the compound ratio of 1:2, 2:3 and 3:5
5. Define objective function
6. If $CosA = \frac{4}{5}$ find $Cos2A$
7. Find the centre and radius of $3x^2 + 3y^2 - 6x - 12y - 2 = 0$
8. Evaluate $\lim_{x \to \infty} \left[\frac{2^x - 1}{3x} \right]$
9. If $y = \sqrt{\log a} + (\log a)^n + \frac{1}{6}\sin 30^0 + \sqrt{\log x^2}$ find dy/dx
10. Evaluate $\int \frac{1}{\tan^2 x}dx + \int \frac{1}{\sin^2 x}dx + \int \frac{1}{2x-3}dx$

PART-B

II. Answer any TEN questions. **10x2=20**

11. If $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 0 & -1 \\ 0 & 1 & -2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ find the value of x, y and z.
12. If $np_r = 240$, $nc_r = 120$, find the value of n and r.
13. What is the probability that a randomly chosen two digit number is a multiple of 3
14. If $p \to (\sim q \vee r)$ is false, find the truth value of p, q and r.
15. Two numbers are in the ratio 6:7, if the difference of their squares is 117. Find the numbers.
16. A banker pays ₹2380 on a bill of ₹2500, 73 days before the legal due date. Find the rate of discount charged by the banker.
17. Prove that $\sin 105^0 + \cos 105^0 = 1/\sqrt{2}$
18. Prove that $\cos^6 A + \sin^6 A = 1 - \frac{3}{4}\sin^2(2A)$
19. Find the focus, directrix and ends of latus rectum for $x^2 + 16y = 0$
20. Evaluate $\lim_{x \to 0} \frac{\sin 3x + 7x}{4x + \sin 2x}$
21. Differentiate $\sin^2 x$ w.r.t $(\log x)^2$

22. If $V=\sqrt{S^2+1}$ prove that acceleration is 'S' where V is the velocity and 'S' is the displacement.
23. Evaluate $\int\sqrt{1+\sin 2x}.dx$
24. Evaluate $\int_0^{\pi/2}\sin 2x.dx$

PART-C

III. Answer any TEN questions. **10x3=30**

25. If $2A+B=\begin{bmatrix}2&3&1\\1&4&0\end{bmatrix}, 3A+2B=\begin{bmatrix}4&6&1\\2&3&5\end{bmatrix}$ find A and B.
26. Solve for $x\begin{vmatrix}3x-8&3&3\\3&3x-8&3\\3&3&3x-8\end{vmatrix}=0$
27. Find the number of permutations of the letters of the word ASSASSINATION. In how many of these.
    (i) the vowels are in even places
    (ii) the word NATION is always present together
    (ii) begins with 'AS and ends with 'AS'
28. Two dice are rolled simultaneously. Find the probability of
    (a) getting a total of 11 (b) getting sum greater than 11
    (c) getting a multiple of 2 on one die and a multiple of 3 on the other.
29. If 10 men or 20 boys can do piece of work in 30 days, how long will 30 boys and 5 men take to do the same work?
30. The banker's gain on a bill is $\frac{1}{9}^{th}$ of the banker's discount, rate of interest being 10% p.a. Find the unexpired period of bill.
31. Jane sells her ₹12500, 4.5% stock at 94. How much of 9% stock at 125 can Jane purchase from the sale proceeds of the former stock. What is the change in Jane's income?
32. A shopkeeper bought a TV at a discount of 30% of the listed price of ₹24,000. The shopkeeper offer a discount of 10% of the listed price to the customer. If the VAT is 10%. Find (i) the amount paid by the customer (ii) the VAT to be paid by the shopkeeper
33. Find the equation of the tangents to the circles $x^2+y^2+2x+4y-4=0$ which are parallel to the line $5x+12y+6=0$
34. Discuss the continuity of the function

$$f(x)=\begin{cases}3x^2+1 & if \quad x<1\\ 4 & if \quad x=1\\ 2x+2 & if \quad x>1\end{cases} \quad \text{at } x=1$$

35. Differentiate "$Sin\ x$" w.r.t x from 1st principle
36. Find total revenue by raising output form 10 units to 20 units when the marginal revenue function is $2q^2-q$ where q is the output.
37. The product of two natural members is 64. Find the numbers if their sum is minimum
38. Evaluate $\int x^2\sin x.dx$

PART-D

IV. Answer any SIX questions. **6x5=30**

39. Solve using matrix method
$$x-y-2z=3$$
$$2x+y+z=5$$
$$4x-y-2z=1$$

40. Find the term independent of x in $\left(\frac{\sqrt{x}}{2}-\frac{2}{x^2}\right)^{10}$

41. Resolve into partial fractions $\frac{4x^2-3x+5}{(2-x)(1+x)}$

42. Verify the proposition for logical equivalence $\sim(p\leftrightarrow q)\,and\,(p\wedge\sim q)\vee(q\wedge\sim p)$

43. Four numbers are in proposition. The sum of the extremes is 54 and the sum of the means is 36. If the ratio of their means is 2:1. Find the numbers.

44. The production manager of a company obtained the following equation for the learning effect $y=1400x^{-0.3}$.This function is based on the company's experience for assembling the first 50 units of the product. The company was asked to bid a new order of 100 additional units and the labour cost for producing an additional 100 units at the rate of ₹20/hour.

45. Solve the L.P.P graphically

$Z\min = x-7y+190$

subject to the constraints

$x+y\le 8$

$x\le 5$

$y\le 4$

$x+y\ge 4$

$x,y\ge 0$

46. Prove that $Cos20^0.Cos40^0.Cos80^0=\frac{1}{8}$

47. If $x^2+2xy+3y^2=1$. Show that $y_2=-\frac{2}{(x+3y)^3}$

48. Find the area of the region between the parabolas $y^2=4ax$ and $x^2=4ay$

PART-E

V. Answer any ONE question. **1x10=10**

49. (a) Evaluate $\lim_{x\to a}\frac{x^n-a^n}{x-a}=na^{n-1}$ for all rational. **6**

(b) Expand $(0.99)^5$ using binomial theorem upto 4 decimal. **4**

50. (a) Show that the points (0,0) (1,1) (5,-5) and (6,-4) are concyclic **6**

(b) Two towers of height 14m and 25m stand on level ground. The angles of elevation of their tops from a point on the line joining their feet are 45^0 and 60^0 respectively. Find the distance between the towers. **4**

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