JAIN COLLEGE, J C Road, Bangalore
Mock Paper – 1, January - 2020
II PUC – Basic Mathematics (75)

Time: 3 Hours 15 Minutes **Max. Marks: 100**

NOTE: All questions must be answered without considering the choice in each part from A to E

PART A

I. Answer all the questions **1x10=10**

1. Find x, such that $A=\begin{bmatrix}3 & x\\ 4 & 7\end{bmatrix}$ is symmetric.
2. How many six digit numbers can be formed with the digits 2, 7, 6,1,9,8.
3. Negate the following:" if 6 is a divisor of 120 then 486 is not divisible by 6".
4. Find the compound ratio of 3:5 and 4:7.
5. Define yield
6. Express the following as product of two trigonometric functions, $\cos 10^0-\cos 50^0$.
7. Show that the circle $x^2+y^2+4x-3y+4=0$ touches x-axis.
8. Evaluate the limit: $\lim_{n\to\infty}\left(1+\frac{2}{n}\right)^n$
9. Differentiate w.r.t x $\sqrt{\cot\sqrt{2x}}$
10. $\int 6\sqrt{x}\,dx$

PART B

II. Answer any ten of the following questions **2x10=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 x,y,z
12. Find the number of ways in which 15 staff members can be seated around a circular table for a meeting, if the vice principal and dean have to be on either sides of the principal.
13. What is the probability that a randomly chosen 2 digit positive integer is a multiple of 3 .
14. Write the inverse and contrapositive of the implication, $"if\ x\in A\cup B\ then\ x\in A\ or\ x\in B".$
15. What must be added to each term in the ratio 5:6, so that it becomes 8:9.
16. A banker discounts a bill for certain amount having 73 days to run before it matures at 15% P.a . The discounted value of the bill is Rs.970, what is the face value of the bill?
17. Prove that : $\frac{\cos 3A}{2\cos 2A-1}=\cos A$
18. If $\sin A=\frac{7}{25},\cos B=\frac{-12}{13}$ find the value of cos(A-B).
19. Find the equation of the parabola whose focus is at (1,0) and directrix is at x=-1.
20. Find k , if $f(x)=\begin{cases}\frac{e^{5x}-1}{2x} & x\neq 0\\ \frac{k+x}{2} & x=0\end{cases}$ is a continuous function at x=0

21. Differentiate w.r.t x

$\tan(\log(\sin x))$

22. The total cost of the commodity is given by $c(x)=x^2-7x+2$, where x is the number of units and the price per unit is Rs5.00. find the profit function.

23. $\int \sqrt{1+\cos 2x}\, dx$

24. Find the area bounded by the curve $x=2y^2$, y-axis and the abscissa y=2and y=4.

PART C

III. Answer any ten of the following questions **3x10=30**

25. If $B+A=\begin{bmatrix}1 & -1 & 3\\ 2 & 3 & 4\end{bmatrix}$ *and* $B-A=\begin{bmatrix}2 & 3 & 1\\ 3 & 4 & 2\end{bmatrix}$ *find B.*

26. $If\ A=\begin{bmatrix}1 & 3\\ -1 & 4\end{bmatrix}$ *find* $A.A^T$

27. A man has 10 relatives, 4 of them are ladies 3 are gentle men and 3 children. In how many ways can he invite 7 relatives to a dinner party so that.
    i. There are exactly 2 ladies, 3 gentle men and 2 children.
    ii. There are exactly 2 gentlemen and atleast 3 ladies.
28. A die is thrown twice and the sum of the numbers appearing is observed to be 9, what is the conditional probability that the number 4 has appeared atleast once.
29. Four numbers are in proportion. The sum of the extremes is 54 and the sum of the mean 36. If the ratio of their means is 2:1, find the numbers.
30. The bankers gain on a bill is $1/5^{th}$ of the bankers discount and the rate of interest is 20%p.a, find the unexpired period of the bill.
31. A man invested equal sum of money in 4%, 5% and 6% stock, each stock being at par, if the total income of the man is Rs3600. Find the total investment.
32. Sanju, owner of a jeweler shop purchased a ear ring of Rs2000 at 12% VAT and sells it at 2,300 to Radhika. If Radhika also pays 12% VAT to the shopkeeper how much did the Shop keeper deposit to the government as VAT.
33. Find the equation of the parabola given that vertex is at origin, axis is y-axis and passes through (1/2,2)
34. If $y=\log\left[\frac{1-\cos x}{1+\cos x}\right]$ $provethat\ \frac{dy}{dx}=2\cos ecx$
35. The sides of an equilateral triangle are increased at the rate 3cm/sec, how fast is its area increasing when the side is 10 cm.
36. The demand function of a firm is p=500-0.2q and the total cost c=25q+10000 (p=price, q=output). Find the output at which the profit of the firm is maximized .what is the price change
37. $\int \frac{\sin 2x}{\left(1-\cos^2 x\right)^3}\, dx$

38. Integrate w.r.t x , $\int \frac{2x+5}{\left(x^2+5x+3\right)^2}dx$

PART D

IV. Answer any six of the following questions **6x5=30**

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

40. Construct the truth table for $(p \leftrightarrow q) \wedge \sim (q \leftrightarrow r)$.

41. 8 men and 16 women can finish a job in 6 days but 12 men and 24 women can finish it in 8 days. How many days will 26 men and 20 women take to finish the same job?

42. XYZ Company supplies water tankers to government. The first water tanker takes 20000 labour hours. The government auditors suggest 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 labour cost the company will incur at the rate of Rs20 per hour?

43. Solve graphically: Maximize z=5x+3y, subjected to the constraints:

$3x+5y \leq 15\ , 5x+2y \leq 10\ , x\ and\ y \geq 0$

44. If $A+B+C=180^0$, prove that $\sin^2 A+ \sin^2 B+\sin^2 C=2+2\cos A\cos B\cos C$.

45. Find the equation of the circle passing through the point (-1, 2) and(3,-2) and has its center on x=2y.

46. Differentiate 'sinx' from the first principle.

47. The marginal cost is 8+0.08x and the marginal revenue is 16. Find the total revenue, total cost and total profit. Assume that the fixed cost is nil

48. Find the coefficient of $x^8\ in \left(3x^2-\frac{1}{2x}\right)^{10}$

PART E

V. Answer any one of the following questions **10x1=10**

49.

a. A sales person has the following records of sales for the month of January February and march 1996 for the product A,B,C. the person is paid a fixed rate of commission per unit but a varying rates for product A,B and C .

Months	Sales in Units			Commission in Rs.
	A	B	C	
January	9	10	2	800
February	15	5	4	900
March	6	10	3	850

Find the rate of commission payable on A,B and C per unit sold .

b. Expand $(0.99)^5$ using binomial theorem up to 4 decimals.

50.

a. Prove: $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1, if\ \theta\ is\ in\ radian.$

b. A person standing on the bank of a river observe that the angle subtended by a tree on the opposite bank is 60^0 . When he returns 40 meters from the bank he finds the angle to be 30^0, find the height of the tree and the breath of the river.

*****

JAIN COLLEGE, J C Road, Bangalore
Mock Paper – 2, January - 2020
II PUC – Basic Mathematics (75)

Time: 3 Hours 15 Minutes **Max. Marks: 100**

NOTE: All questions must be answered without considering the choice in each part from A to E

PART A

I. Answer all the questions **1x10=10**

1. If A=$\begin{bmatrix} -1 \\ 3 \\ 5 \end{bmatrix}$ and B= $\begin{bmatrix} 2 & -2 & 1 \end{bmatrix}$ find BA
2. In how many ways can 10 people be seated around a table?
3. Negate the following:" if the number is real then it is either rational or irrational".
4. Find the duplicate ratio of 4:7
5. Define learning index
6. If sinA= $\frac{5}{13}$, cosA= $\frac{12}{13}$ find sin(A+B)
7. Find the centre and the radius of the circle $x^2+y^2+8x-10y+8=0$
8. Evaluate the limit $\lim_{x\to 0}\left(\frac{2^x-1}{3x}\right)$
9. Differentiate cos2x with respect to x.
10. $\int \frac{8}{\cos ecx}dx$

II. Answer any ten of the following questions **2x10=20**

11. prove that:"if in a determinant the element of any row (or column) are multiplied by the same scalar K, then the value of the determinant is K times the given determinant".
12. If $\overset{n}{p}_3 = 210$, find n.
13. If P(A)= 4/13, P(B) = 13/52 and P(AUB)= 4/13 . find P(A/B)
14. If p is true and q is false, find the truth value of $\sim(p \to \sim q) \vee \sim p$
15. What must be added to each term in the ratio2:3 so that it becomes 5:6.
16. If the bill period is 6 months and the legal due date is 14-3-2018, find the draw date .
17. If tan A=1/2 and tan b=1/3 find the value of tan (A+B).
18. Prove that : $\cos\left(A+\frac{\pi}{4}\right)=\frac{1}{\sqrt{2}}(\cos A-\sin A)$
19. Find the equation of the parabola whose focus is (-4,0)and the drectrix is x=4 whose vertex is at (0,0).
20. Find the value of k, for which $f(x)=\begin{cases} k+x, & x=1 \\ 4x+3 & x\neq 1 \end{cases}$ is continuous at x=1.
21. Differentiate with respect to x , $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$

22. Find the interval in which f(x) =5+36x+3x^2-2x^3 is increasing and decreasing.
23. Evaluate $\int\left(x-\frac{1}{x}\right)^3 dx$
24. The marginal revenue is $30-\frac{x}{30}$, find the total revenue also find the average revenue.

III. Answer any ten of the following questions 3x10=30

25. If A=$\begin{bmatrix}-1 & 2\\ 3 & -4\end{bmatrix}$, $verify\ A.(adjA)=(adjA).A=|A|.I$.
26. Prove the property : " In a determinant if any 2 rows(/2column)are identical then value of determinant is zero ".
27. Find the number of permutations of the letter of the word MISSISSIPPI in how many of these (i) the 4s are together (ii) 4s are not together.
28. What is the probability that a card drawn from a pack of 52 cards is (a) Diamond or Heart (b) King or Queen.
29. A mixture contains milk and water in the ratio 5:1 on adding 5 liters of water , the ratio of milk and water becomes 5:2 , find the quantity of milk in the original mixture.
30. A banker pays Rs.4520 on a bill of Rs.5000, 146 before legally due date. Find the rate of discount charged by the banker.
31. What is the market value of 6% stock, if it earns an interest of 4.5% after deducting an income tax of 4%.
32. A shopkeeper sells an item at the price of Rs. 810 including sales tax of 8% , what should the customer pay for the same item if the sales tax is reduced to 6%.
33. Find the focus , equation of directrix and ends of latus rectum of y^2=-16x
34. Find $\frac{dy}{dx}$ if $x=e^{\log\sin 4t}$ and $y=e^{\log\cos 4t}$
35. A ladder 17 feet long leans against a smooth vertical wall , if the lower end is moving at the rate of 2 ft towards the wall . find the rate at which the upper end is moving when the lower end is at 8ft from the wall.
36. Find the maximum and minimum value of f(x)=x^5-5x^4+5x^3-1
37. Integrate sin5xsin2x with respect to x.
38. Integrate $\int_0^{\frac{\pi}{2}}\frac{\sin x}{1+\cos x}dx$

IV. Answer any six of the following questions 6x5=30

39. Solve by matrix method : x+y-z=1, 3x+y-2z=3,x-y-z=-1
40. Find the term independent of x in the expansion $\left(\sqrt{x}+\frac{1}{4x^2}\right)^{10}$
41. Resolve into partial fraction: $\frac{1+2x}{(x+2)^2(x-1)}$
42. Prove that $p\leftrightarrow q\ and[(p\rightarrow q)\wedge(q\rightarrow p)]$ are logically equivalent
43. Divide 17640 into P,Q,R and S such that , Q gets $\frac{2}{5}^{th}$ of P, R gets $\frac{5}{8}^{th}$ of Q and S gets $\frac{2}{13}^{th}$ of the sum of Q&R.

44. A first sample batch of 50 units of a product A took 80 hours to make. The company now wishes to estimate the average time per unit will be if the total output of the product A is 200 units and 80% learning rate applies.
45. Vishal consumes two types of food A and B every day to obtain minimum 8 units of protein 12 units of carbohydrate and 9 units of fats which is his daily requirement. 1 kg of food A contains 2,6,1 units of protein , carbohydrate and fat respectively. 1 kg of B contains 1,1and 3 units of protein, carbohydrate and fats respectively. Food A cost Rs.8per kg and B cost Rs. 5 per kg. Formulate the LPP and solve graphically.
46. Prove that : $\cos 10^0 \cos 30^0 \cos 50^0 \cos 70^0 = \frac{3}{16}$
47. $if \quad y = a\cos mx + b\sin mx \text{ , } show that \frac{d^2y}{dx^2} + m^2 y = 0..$
48. Find the area bounded by the parabola $y^2 = 16x$ and its latus rectum.

V. Answer any one of the following questions **10x1=10**

49.
   a. Find the equation of the circle passing through (1,2) and (2,1) and the centre is on y axis.
   b. 2 towers of height 14m and 25m stand on a level ground .the angle 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 two towers.

50.
   a. If n is a rational number and a is a non zero real number then prove that $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$ (all three cases).
   b. Using binomial theorem $(102)^6$, upto 4 decimal places.

******