JAIN COLLEGE, J C Road, Bangalore
Mock Paper - 1 January - 2019
II PUC – Basic Mathematics (75)

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

PART A

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

1. If $A=\begin{bmatrix}2 & -x\\ x & -7\end{bmatrix}$ .Find $A+A'$
2. If $nP_4 = 360$. Find n.
3. Negate the proposition : $\sim p \rightarrow q$
4. If 5:20=3: x ,Find the value of x.
5. Define Yield.
6. If $SinA=\frac{3}{5}$. Find Sin 2A.
7. If the radius of the circle $x^2+y^2+4x-2y-k=0$ is 4 units, Find k.
8. Evaluate $\lim_{x\to 0}\frac{x^3+27}{x+3}$.
9. If $y=e^{\log(\cot x)}$,Find $\frac{dy}{dx}$.
10. Evaluate $\int\frac{1}{8x+9}dx$

PART B

II. Answer any ten of the following questions **2x10=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 how many ways can 3boys and 4 girls be arranged in a row so that all the 3 boys sit together?
13. If $P(A)=\frac{1}{2}$ and $P(B)=\frac{1}{3}$ and $P(A\cup B)=\frac{7}{12}$ .Find $P(B/A)$.
14. Write the converse and contra positive of "$If \quad x^2=y^2 \quad then \quad x=y$."
15. Monthly incomes of A and B are in the ratio 2:3 and their monthly expenditures are in the ratio 3:5.If each saves Rs.100 per month,Find the monthly incomes of A and B.
16. Bankers discount and Bankers gain on a certain bill due after sometimes are Rs.1250 and Rs.50 respectively.Find the facevalue of the bill.
17. Prove that $Sin2A=\frac{2\tan A}{1+\tan^2 A}$
18. Show that $\frac{\sin 4x+\sin 2x}{\sin 4x-\sin 2x}=\tan 3x.\cot x$
19. Find the equation of the circle whose end points of a diameter are (3,4) and (2,-5).

20. Find K if the function $f(x) = \begin{cases} k+x & , x = 1 \\ 4x+3 & , x \neq 1 \end{cases}$ is continous at x=0.

21. If $y = x^{\sin x}$ .Find $\frac{dy}{dx}$

22. If the total cost of production is given by $C(x) = 5x^2 + 2x + 3$ .Find Average cost and marginal cost for an output of 10units.

23. Evaluate $\int \frac{1}{\sqrt{x}+x}\,dx$

24. Evaluate $\int_{\frac{-\pi}{4}}^{\frac{\pi}{4}} \operatorname{cosec}^2 x\,dx$

PART C

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

25. If $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ then prove that $A.(adjA) = (adjA).A = |A|I$

26. Prove that $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$

27. Find the number of permutations of the letters of the word “COMMITTEE”. How many of these
a) have all the vowels together b) begin with T and end with T?

28. Two cards are drawn from a pack of playing cards one after the other. Find the probability of getting a queen in first and second draw if the cards are drawn 1) with replacement 2) without replacement.

29. 3 carpenters can earn Rs.360 in 6days working 9hours a day. How much will 8 carpenters earn in 12 days working 6hours a day?

30. Bankers gain on a bill due 6 months at 4% p.a is Rs.20.Find the true discount, bankers discount and bill amount?

31. Sanjana invests Rs.3240 in a stock at 108 and sells when the price falls to 104.How much stock at 130 can sanjana buy now?

32. The price of a washing machine inclusive of sales tax is Rs.13530.If the sales tax is 10%.Find the basic price.

33. Find the coordinates of the focus, equation of the directrix and coordinates of the ends of the latus rectum of the parabola $x^2 + 16y = 0$

34. Differentiate e^x with respect to x from first principle.

35. The surface area of a spherical soap bubble increasing at the rate of $0.6cm^2 / \sec$. Find the rate at which its volume is increasing when its radius is 3cm.

36. If $S = 2t^3 - 5t^2 + 4t - 3$ (S= distance ,t=time) find
    1) the time when the acceleration is $14\ ft/\sec^2$
    2) the velocity and displacement at that time
37. Evaluate $\int x \log x \ dx$
38. Evaluate $\int_0^1 \frac{2x+5}{x^2+5x+3} dx$

PART D

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

39. Evaluate $(2+\sqrt{3})^5 + (2-\sqrt{3})^5$ using binomial theorem.
40. Resolve into partial fractions $\frac{3x+5}{(x+2)(x-1)^2}$
41. Verify if the proposition $[\sim p \wedge (p \vee q)] \rightarrow q$ is a tautology or contradiction or neither
42. Rs.5625 is divided among A,B and C so that A receives one half as much as B and C together receive and B receives one fourth of what A and C together receive .Find the share of A,B and C.
43. XYZ Company supplies water tankers to the government. The first water tanker takes 20000 labour hours. The government auditors suggest that there should be a 90% learning effect.The management expects an order of 8 water tankers in the next year. What will be the labour cost if the company will incur at the rate of Rs.20 per hour?
44. Solve the LPP graphically. Maximize Z=6x+8y ,Subject to constraints
    $4x + 2y \le 20,\ 2x + 5y \le 24 \ \ and \ \ x \ge 0, y \ge 0.$
45. Find the equation of the circle passing through the points (0,2),(3,0)and (3,2)
46. Prove that $\cos 20^0 . \cos 40^0 . \cos 80^0 = \frac{1}{8}$
47. If $y = \log\left(x - \sqrt{x^2+1}\right)$ Prove that $(x^2+1)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$
48. Find the area enclosed between the parabola $4y = 3x^2$ and the line $3x - 2y + 12 = 0$.

PART E

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

49. A) Prove that $\underset{x \to a}{Lt} \frac{x^n - a^n}{x-a} = na^{n-1}$ for all values of n. all three cases
    b)The angles of elevation of the top of a tower from the base and the top of a building are $60^\circ \ \ and \ \ 45^\circ$ respectively. The building is 20m tall. Find the height of the tower.
50. a)Solve by matrix method
    $x + y + z = 5 \ \ ,2x + y - z = 2 \ \ ,2x - y + z = 2$
    b)Find the value of $(1.2)^5$ using binomial theorem upto 4decimal places

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Mock Paper - 2 January - 2019
II PUC – Basic Mathematics (75)

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

PART A

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

1. Find x, such that $\begin{bmatrix} 3 & x \\ 4 & 7 \end{bmatrix}$ is symmetric.
2. If $5P_r = 60$. Find the value of r.
3. Symbolise the proposition: $33 \div 11 \neq 3 \ or \ 8-6=2.$
4. Find the mean proportional of $0.8 \ \ and \ \ 1.8$
5. Find the index of learning of 80% learning effect?
6. Find the value of sin75.
7. Find the equation of the circle with (-4,3) and (12,-1) are the end points of the diameter.
8. Evaluate $\underset{x\to 2}{Lt} \dfrac{x-2}{x^{\frac{1}{3}} - 2^{\frac{1}{3}}}$.
9. Differentiate $e^{\log_e\left(x+\sqrt{x^2+a^2}\right)}$ with respect to x
10. Integrate $6\sqrt{x}$ with respect to x

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

11. If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$.Show that $A^2 - 4A + 3I = 0$
12. There are 12 points in a plane of which 5 are collinear. Find the number of straight lines.
13. If $P(\overline{A}) = 0.65$ and $P(A \cup B) = 0.65$ .Find $P(B)$ if A and B are mutually exclusive events..
14. If the truth value of the proposition $(p \wedge q) \rightarrow (r \vee \sim s)$ is False, then find the truth value of p,q,r,s.
15. If $a : 3 : 15 = 5 : b : 5$ Find a and b.
16. A bankers pays Rs.2380 on a bill of Rs. 2500, 73 days before the legal due date. Find the rate of discount charged by the banker.
17. Prove that $\sin(45^0 + A) + \cos(45^0 + A) = \sqrt{2}\cos A$
18. Prove that $\dfrac{1+\sin 2\theta}{\cos 2\theta} = \dfrac{1+\tan\theta}{1-\tan\theta}$
19. Find the equation of the parabola given that its vertex is (0,0) ,axis is y-axis and passes through $\left(\frac{1}{2}, 2\right)$.

20. Evaluate $\lim_{x\to 0}\frac{\cos^2 x}{1-\sin x}$
21. Differentiate $\cos^5 x.\cos(x^5)$ with respect to x.
22. Find the domain of the increasing and decreasing function $f(x)=x^2-4x+3$
23. Prove that $\int \tan x\,dx=\log(\sec x)+c$
24. Evaluate $\int_0^1 \frac{e^x+1}{e^x}\,dx$

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

25. Prove that if each element of a row (or column) is mulitiplied by a scalar and added to the corresponding elements of any row (or column), then the value of the determinant is unaltered.
26. Prove that $\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix}=1+a+b+c$
27. 5men and 4women are to be seated in a row so that the women occupy the even places. How many such arrangements are possible?
28. A bag contains 7white, 3red and 4black balls. One ball is picked up random .What is the probability that a) none is black b) its a white ball c) ball is red.
29. X, Y and Z play cricket. The runs scored by X and Y are in the ratio 3:2.Y's run to Z's is in the ratio 3:2, together they all score 342 runs. How much did each score?
30. The difference between BD and TD on a certain sum of money due 6 months is Rs.27.Find the amount of the bill if the rate of interest is 6% per annum.
31. How much money must be invested in 14.25% stock at 98 to produce the same income as would obtained by involving Rs.9975 in 15% stock at 105.
32. A color T.V is marked for sale for Rs.17600 which includes sales tax of 10%.Calculate the sales tax.
33. Find the length of the latus rectum,Coordinates of the ends of the latus rectum and equation of the tangent at the vertex of the parabola $x^2=-16y$
34. Differentiate $\log x$ with respect to x from first principle.
35. The sides of an equilateral triangle is increasing at the rate of $\sqrt{3}$ cm/sec. Find the rate at which Its area is increasing when its sides is 2meters.
36. Divide 64 into two parts such that the sum of the cubes of the two parts is minimum
37. Evaluate $\int x.\sin(5x+7)\,dx$
38. Evaluate $\int \frac{e^{2x}+1}{e^{2x}-1}dx$

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

39. Find a if the 17th and 18th term of the expansion $(2+a)^{50}$ are equal
40. Resolve $\frac{x^3-2}{x(x+1)^2}$ into partial fractions

41. Prove that $(p \vee q) \wedge (\sim p \wedge \sim q)$ is a contradiction.
42. If 2men and 4women can do a work in 33 days, 3men and 5women can do the same work in 24 days, how long will it take for 5men and 2women to do the same work.
43. The production manager of the company obtained the following equation for learning effect $y = 1356x^{-0.3219}$ this function is based on company experience for assembling the first 50 units of the product.Find the labour hours required to assemble 100 units.
44. Solve the LPP graphically. Maximize $Z = -x + 2y$,Subject to constraints $x \geq 3,\ x + y \geq 5, x + 2y \geq 6 \ \ and \ \ x \geq 0, y \geq 0.$
45. Show that the points $(2,-4),(0,0),(3,-1) \ and \ (3,-3)$ are concyclic.
46. Prove that $Sin20^0.Sin40^0.\sin 60^0.Sin80^0 = \frac{3}{16}$
47. If $x^2 + xy + y^2 = a^2$ Prove that $\frac{d^2y}{dx^2} = \frac{-6a^2}{(x+2y)^3}$
48. Find the area bounded between the parabola $y^2 = 4ax$ and $x^2 = 4ay$.

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

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

    b) A flag staff stands upon the top of a building at a distance of 20meters.The angle of elevation of the flag staff and the building $45^\circ \ \ and \ \ 60^\circ$ respectively .Find the height of the flag staff.
50. a) Solve by matrix method

    $x - y + 2z = 3$,$2x + z = 1$,$3x + 2y + z = 4$

    b) Find the value of $(1.01)^5$ using binomial theorem upto 4 decimal places