JAIN COLLEGE, Bangalore
Mock Paper - 1 January - 2016
II PUC – Basic Mathematics (75)

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

PART A

I. Answer any ten questions **1 × 10 = 10**

1. If $A=\begin{bmatrix}1\\4\\2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 3 & 4\end{bmatrix}$.find AB
2. In how many ways can 9 flowers of different colors be strung together to form a garland?
3. Write the truth value of "If $\sqrt{2}$ is irrational then $\sqrt{2}$ is a real number".
4. Find the mean proportional of 1/16 and 1/25.
5. Define yield
6. If $\cos A=\frac{\sqrt{3}}{2}$ find cos2A
7. Find the other end of the diameter if one end of the diameter of the circle $x^2+y^2+4x-6y-12=0$ is (-5,-1)
8. Evaluate $\lim_{x\to 0}\frac{3^x-2^x}{x}$
9. Differentiate $x+\sqrt{xy}=x^2$ wrt x
10. Integrate $\frac{7^x-6.8^x}{5^x}$ wrt x

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

11. If $\begin{bmatrix}2 & 3\\7 & 5\end{bmatrix}+\begin{bmatrix}2 & x-2\\y-1 & 5\end{bmatrix}=\begin{bmatrix}4 & 1\\7 & 10\end{bmatrix}$ find x and y.
12. In how many ways can 6 people be chosen out of 10 people if one particular person is always included.
13. The probability of occurrence of 2 events A and B are ¼ and ½ respectively. The probability of their simultaneous occurrence is 7/50. What is the probability that neither A nor B occurs.
14. Write the converse and contrapositive of " If 2 straight lines are parallel then they do not intersect".
15. A ratio in the lowest terms is 3:7. If the difference between the quantities is 24, find the quantities.
16. Bankers discount and bankers gain on a certain bill due after sometime are Rs.1250 and Rs.50 respectively. Find the face value of the bill.
17. If $\tan A=5/6, \tan B=1/11$,show that $A+B=\pi/4$
18. Prove that $\frac{\cos^3 A-\sin^3 A}{\cos A-\sin A}=1+\frac{1}{2}\sin 2A$
19. Find the equation of the parabola given that its focus is (0,-3) and directrix is y=3
20. Evaluate $\lim_{n\to\infty}\frac{\sum n^3}{n^2\sum n}$
21. Differentiate $(\sin x)^{\tan x}$ wrt x

22. If the displacement 's' at any time 't' is given by $s=\sqrt{1-t}$. Show that velocity is inversely proportional to the displacement.
23. Evaluate $\int \sin^3 x dx$
24. Evaluate $\int_0^3 \frac{x+3}{x+2} dx$

PART C

III. Answer any ten **3 × 10 = 30**

25. Solve the equation by cramers rule

    3x+2y=8,4x-3y=5
26. If $A=\begin{bmatrix}1 & 2 & -3\\ 1 & -4 & 1\\ 0 & 5 & 3\end{bmatrix}$ $B=\begin{bmatrix}4 & -2 & -3\\ 2 & -4 & -1\\ 0 & 1 & 3\end{bmatrix}$ $C=\begin{bmatrix}4 & 1 & 2\\ 0 & 3 & 1\\ -1 & -3 & 4\end{bmatrix}$ verify (A+B)C=AC+BC
27. A family of 4 brothers and 3 sisters is to be arranged for a photograph in one row. In how many ways can they be seated if
    i. All the sisters sit together
    ii. No 2 sisters sit together
28. Among the members of a committee, there are 75% males and 25% females. The probability that a male members becomes the president is 0.25 and probability that a female member becomes the president is 0.4. find the probability that the person selected at random becomes the president.
29. If 10 men or 20 boys can d0 a piece of work is 30 days,how long will 30boys and 5 men take to do the same work?
30. The bankers gain on a bill is $1/9^{th}$ of the bankers discount,rate of interest being 10%p.a. find the unexpired period of the bill.
31. Sukanya holds Rs.8000 of 3% stock.She sells it at Rs.110 and invests the proceeds in 5% stock. Therby her income increases by Rs.260. find the market price of 5% stock.
32. When the rate of sales tax is decreased from 9% t0 7%. For a radio ,Rahul has to pay Rs.632 less for it . what is the listed price of the radio?
33. Find the focus , directrix, latus rectum ,axis of the parabola $y^2=-12x$
34. Differentiate log sinx wrt $\sqrt{\cos x}$
35. A drop of ink spreads over a blotting papers that the circumference of the blot is 4π cm and it changes3cm/sec. find the rate of increase of its radius and also find the rate of increase of its area?
36. Show that x^x is maximum at x=1/e
37. Evaluate $\int \frac{3x+2}{2x-5} dx$
38. Evaluate $\int \frac{5}{x(3+2\log x)^5} dx$

PART D

IV. Answer any six **5 × 6 = 30**

39. Find the coefficient of x^{18} in $\left(x^2+\frac{3a}{x}\right)^{15}$

40. Resolve into partial fraction $\frac{2x^2+3x+2}{x^2-x-2}$

41. Show that $\left[(p\to q)\wedge(q\to r)\right]\to(p\to r)$ is a tautology

42. Walking 4kmph a student reaches his college 5min late and if he walks at 5kmph, he reache in 2 ½ min early. What is the distance from his house to the college?

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 direct labour hours at Rs20 per hour. They have been asked to bid for a prospective contract of 90 engines. It is expected that there will be 80% learning effect. Estimate the labour cost for the new order.

44. Solve LPP graphically
    Minimize Z=x-7y+190
    Subject to $x+y\le 8, y\le 5, x\le 5, x+y\ge 4$
    $x, y\ge 0$

45. Show that $\cos^2\theta+\cos^2(60^0-\theta)=3/2$

46. find the equation of the circle passing through the points (1,-4) and (5,2)and has its centre on the line x-2y+9=0

47. if $y^x+x^y=a^b$ show that $\frac{dy}{dx}=\frac{-[y^x\log y+yx^{y-1}]}{xy^{x-1}+x^y\log x}$

48. the marginal cost=8+0.08x and the marginal revenue=16. Find the total revenue,total cost and total profit. Assume the fixed cost is nil.

PART E

V. Answer any one question **10 × 1 = 10**

49.

a) A sales person Samanth has the following record of sales for the month of January, Febraury and March 1996 for 3 products A,B and C. he is paid a commission at fixed rate per unit but at varying rates for products A,B and C.\

Months	Sales in units			commission
	A	B	C	In Rs
January	9	10	2	800
Febraury	15	5	4	900
March	6	10	3	850

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

b) A person is at the top of a tower 75ft high from there he observes a vertical pole and finds the angle of depression of the top and the bottom of the pole which are $30^0\ and\ 60^0$ respectively. Find the height of the pole.

50.

a) Prove that $\lim_{x\to 0}\frac{\sin x}{x}=1$ x is an radian and hence deduce that $\lim_{x\to 0}\frac{\tan x}{x}=1$

b) A producer named Samarth has 30 and 17 units of labour and capital respectively which he can use to produce 2 types of goods A and B. to produce one unit of A ,2units of labour and 3units of capital are required. Similarly 3units of labour and 1unit of capital is required to produce one unit of B. if A and B are priced at Rs.100 and Rs.120 per unit respectively,how should the producer use his resources to maximize the total revenue. Formulate the LPP.

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Mock Paper - 2 January - 2016
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PART A

I. Answer any ten questions **1 × 10 = 10**

1. Solve for x: $\begin{vmatrix} x & 3 \\ 12 & x \end{vmatrix} = 0$
2. If ${}^{n}_{4}c = {}^{n}_{5}c$, find n
3. Negate the following : $(p \to (q \wedge r))$
4. Find the compound ratio of the ratios 1:2,2:3,3:4.
5. Define learning curve?
6. Find the value of $3\sin 10^0 - 4\sin^3 10^0$
7. Find the equation of the circle centre is at (-1,-2) and diameter d=25cms
8. Evaluate: $\lim_{x\to 0} \frac{\cos^2 x}{1-\sin x}$
9. Differentiate $x^e + e^x + e^e$ wrt x
10. Integrate $\int \frac{8}{\cos ecx}\,dx$ wrt x

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

11. If $A = \begin{bmatrix} 1 & -3 \\ -4 & -1 \end{bmatrix} and\ B = \begin{bmatrix} 3 & 4 \\ -5 & 1 \end{bmatrix}$ find C, if 2C=A+B
12. How many 6 digit numbers can be formed from 1,2,3,4,5,6(no digit are repeated)which is divisible by 5
13. A bag has 15 tickets numbered from 1 to 15 , two tickets are drawn at random from the bag find the probability that both the numbers are prime?
14. Write the converse and contrapositive of the following statement: $if\ x \in (A \cup B)\ then\ x \in A or\ x \in B$
15. What must be subtracted from the ratio 7:4, so that it becomes 5:2.
16. 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.
17. Prove that tanC=3, if tanA=1 and tanB=2 and also given that $A+B+C=180^0$
18. Prove that $\cos^4 x - \sin^4 x = \cos 2x$
19. Write the equation of axis, directrix and tangent at the vertex for the parabola $X^2+16y=0$
20. Evaluate the limit: $\lim_{x\to 0} \left(\frac{e^x - e^{-x}}{x}\right)$
21. If y=x+tanx show that $\cos^2 x \frac{dy}{dx} = 2 - \sin^2 x$.
22. The total cost of the commodity is given by $c=x^2-7x+2$, where x is the number of units produced. If price per unit is Rs.5 find the profit function.
23. Integrate wrt x $\cos^3 X$
24. Find the area bounded by the curve $3x^2=4y$, y axis y=1 and y=2.

III. Answer any ten questions **3 × 10 = 30**

25. If A=$\begin{bmatrix} 3 & 7 \\ 2 & 5 \end{bmatrix}$ and B=$\begin{bmatrix} 6 & 8 \\ 7 & 9 \end{bmatrix}$ verify $(AB)^{-1}=B^{-1}A^{-1}$
26. Solve by cramer's rule : 2x+y=1 , x-3y=4
27. Find the number of permutation of the letters of the word "Engineering". How many of these
    a. begin with GIN and end with GRIN
    b. all vowels are together
28. What is the probability that a card drawn from a pack of 52 cards is red or a queen?
29. A mixture contains milk and water in the ratio 6:1 on adding 5 liters of water the ratio of the milk and water becomes 7:2, find the quantity of milk in original mixture.
30. A bill for Rs.2920 was drawn on sep 11th for 3 months after due and was discounted at 16% p.a for Rs.2875.20, on what date was the bill discounted?
31. Sukanya holds Rs. 8000 of 3% stock she sells it at Rs.110 and invest the proceeds in 5%stock thereby her income increased by Rs.260 find the market price of 5% stock.
32. Sharath goes to a departmental stores and purchase the following articles
    a. A rain coat for Rs.300 S.T @ 10%
    b. A pair of shoes for Rs. 460 S.T @ 9%
    c. Food article for 450 S.T @ 5%
    d. Cloth for Rs.800 S.T @ 1%. Calculate the total amount of the bill?
33. Find the equation of the parabola given vertex at origin and passing through the point (2,-3)and which is symmetric about y axis.
34. If $x = e^{\log\cos 4\theta}, y = e^{\log\sin 4\theta}$ $showthat \frac{dy}{dx} = \frac{-x}{y}$.
35. A ladder of 15ft long leans against the wall , if the top slides downwards at the rate of 2ft /sec. find how fast is the lower end moving when the lower end is at a distance 12 ft from the wall?
36. The demand function of a firm is p=500-0.2q and the total cost fun C=25q+10000 p is the price and q is the quantity at which the profit of the firm is maximized what is the price charged
37. Integrate $\int \sin 2x\sqrt{1+\sin^2 x}dx$ wrt x
38. Integrate by parts $\int \log x(1+x)dx$

IV. Answer any six **5 × 6 = 30**

39. If A=$\begin{bmatrix} 1 & -4 & -2 \\ -2 & -5 & 4 \\ 1 & 2 & 1 \end{bmatrix}$ verify A.adjA=adjA.A=|A|I
40. The second ,third and fourth term in the binomial expression $(x+a)^n$ are 240,720 and 1080 respectively find x,a and n.
41. Resolve into partial fractions : $\frac{x^2+1}{(x+1)(x-2)^2}$
42. Examine whether the given equation is logically equivalent $p \wedge q \; and \sim (p \rightarrow \sim q)$
43. The monthly income of A and B are in the ratio 9:7 and those of B:C is in the ratio 3:2. If 10% of A 's income and 15% of c's income differ by Rs.18. find the income of A,B and C
44. The production manager of a company obtained the following equation for 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 is at the rate of Rs.20/hr.

45. Archana , a dietician wishes to mix two types of food F1 and F2 in such a way that the vitamin contents of the mixture contains atleast 6 units of vitamin A and 8 units of vitamin B . food F1 contains 2Kg of vitamin A and 3Kg of vitamin B while food F2 contains 3Kg of vitamin A and 4 Kg of vitamin B. food F1 cost Rs.50/Kg anf F2 cost Rs.75/Kg (solve graphically to minimize the cost of the mixture)

46. Prove that: $\frac{\cot A}{\cot A - \cos 3A} + \frac{\tan A}{\tan A - \tan 3A} = 1$

47. If $x\sqrt{1+y} + y\sqrt{1+x} = 0$ where $x \neq y$ *showthat* $\frac{dy}{dx} = \frac{-1}{(1+x)^2}$

48. Evaluate $\int_2^3 \frac{1}{(x+1)(x+2)} dx$

V. Answer any one question **10 × 01 = 10**

49.

a. Show that the points are concylic (2,-4)(3,-1)(3,-3) and (0 ,0).

b. The angle of depression of two boats as observed from the mast of the ship 50mts are 45^0 and 30^0 respectively what is the distance between the boats if they are on the same side of the mast head in line with it.

50.

a. If n is any rational integer and a is a non zero number , prove that $\lim_{x \to a} \left(\frac{x^n - a^n}{x - a} \right) = na^{n-1}$ {all 3 cases}

b. Simplify $\left(3+\sqrt{2}\right)^4 + (3-\sqrt{2})^4$ using binomial theorem.