



JAIN COLLEGE, J C Road, Bangalore
Mock Paper - 1 January - 2017
II PUC – Basic Mathematics (75)

Time: 3 Hours 15 Minutes

Max. Marks: 100

PART A

I. Answer all the questions

1. Find x if $\begin{vmatrix} 1 & x \\ x & 36 \end{vmatrix}$ is singular.
2. How many different arrangements can be made with the letters of the word 'COLLEGE'.
3. If p and r are propositions with truth value F and F respectively, then find the truth values of the compound proposition $q \rightarrow \sim p$.
4. Find the sub triplicate of $64:27$.
5. What income can be obtained from Rs. 800 at 5% stock?
6. If $\sin A = \frac{3}{5}$. A is acute. Find $\cos 2A$.
7. Find center of the circle $3x^2 + 3y^2 + 6x + 9y - 2 = 0$.
8. Evaluate $\lim_{x \rightarrow 0} \frac{\sin 6x}{\sin 3x}$
9. If $y = x^e + e^x + e^e$. find $\frac{dy}{dx}$
10. Evaluate $\int \frac{1}{x^7}$

PART B

II. Answer all the questions

11. If $A = \begin{pmatrix} 1 & -2 \\ 2 & 3 \\ 5 & 1 \end{pmatrix}$ Find AA^T .
12. If ${}^n P_r = 3024$ and ${}^n C_r = 126$ find r .
13. Find the number of diagonals in a decagon.
14. Write the converse and contrapositive of "If x is an integer then x is a real number".
15. The angle of the triangle are in the ratio 2:3:4 find the angles
16. Find the Banker's discount on the bill of Rs. 415 due 9 months at 15% p.a.
17. If $\tan A = \frac{1}{2}$ and $\tan B = \frac{1}{3}$. Prove that $A+B = \pi/4$.
18. Transform $2\sin 40^\circ \cos 20^\circ$ into sum of two trigonometric ratios
19. Find the equation of the parabola given that its vertex is $(0,0)$ and focus is $(0,4)$.
20. Find k if the function $f(x) = \begin{cases} \frac{e^{5x} - 1}{2x}, & x = 0 \\ \frac{k}{2}, & x \neq 0 \end{cases}$ is continuous at $x=0$.
21. Find $\frac{dy}{dx}$ if $y = \log(\sec x \tan x)$
22. If the sum of two numbers is 48, find the numbers whose product is maximum.
23. Evaluate $\int \frac{x^2}{1+x^3} dx$

24. Evaluate $\int_0^1 e^{3x} dx$

PART C

III. Answer all the questions

25. Solve by cramer's rule.
 $x+y+z=7$.
 $2x+3y+2z=17$.
 $4x+9y+z=37$.
26. If $A = \begin{bmatrix} 5 & 4 \\ -1 & 2 \end{bmatrix}$ then verify $A \cdot \text{adj}A = \text{adj}A \cdot A = |A| I$
27. Find the number of permutation of the letters of the word 'COMMITTEE'.
 How many of these
 1) have all the vowels together
 2) begin with E and end with E.
28. A box contains 4 defective and 6 non defective bulbs. Find the probability that atleast 3 bulbs are defective when 4 bulbs are selected at random.
29. 5 men each working 9 hours a day can finish a work in 30 days. How many men are required to finish eight times the work in 25 days each working 8 hours a day?
30. A bill for 2920 drawn at 6 months was discounted on 1-1-2017 for 2916. If the discounted rate is 5 %p.a. on what date was the bill drawn?
31. Ramu invested Rs. 55000 partly in 8% stock at 80 and 12% stock at 150 in such a way as to get a return of 9% for his money. How much did he invest in each.
32. Gopal purchased a scooter costing Rs. 32,450. If the rate of sales tax is 9 %. Calculate the total amount payable by him.
33. Find the co-ordinate of the focus, equation to the directrix and co-ordinate of the ends of the latus rectum of the parabola $y^2=6x$.
34. Differentiate \sqrt{x} w.r.t x , from first principles.
35. A ladder 17 feet long leans against a smooth vertical wall. If the wall. If the lower end is moving at the rate of 2 ft/min. Find the rate at which the upper end is moving when the lower end is 8 ft from the wall.
36. If the cost function of the firm is given by $c(x) = x^3 - 3x + 7$. Find Average cost and marginal cost when the output $x = 6$ units.
37. Evaluate. $\int x \cos x dx$
38. Evaluate. $\int \frac{3}{(x+1)(x+2)} dx$

PART D

IV. Answer all the questions

39. Solve by Matrix method : $x+y+z=5, 2x+y-z=2, 2x-y+z=2$
40. Evaluate $(\sqrt{3} + 1)^5 - (\sqrt{3} - 1)^5$
41. Resolve $\frac{2x+3}{(x+1)^2(x-3)}$ into partial fractions.
42. Prove that $p \rightarrow (q \wedge r) \equiv (p \rightarrow q) \wedge (p \rightarrow r)$.
43. Distribute Rs 1,647 amongst A, B and C in such that $\frac{3}{7}$ th of A, $\frac{2}{3}$ rd of B and $\frac{4}{5}$ th of C are equal.

44. Arvind 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 rate. The Management expects an orders 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?
45. Solve L.P.P graphically:
 Maximize $Z = 6x + 8y$
 Subject to the constraints.
 $4x + 2y \leq 20$
 $2x + 5y \leq 24$
 $x, y \geq 0$
46. Prove that $\sin 3A = 3\sin A - 4\sin^3 A$.
47. If $xy + 6y = 2x$. Show that $\frac{d^2 y}{dx^2} = \frac{-24}{(x+6)^3}$
48. Find the area bounded by the parabola $y^2 = 16x$ and its latus rectum

PART E

V. Answer all the questions

49. a. Show that the point $(2, -4)$, $(0, 0)$, $(3, -1)$ and $(3, -3)$ are concyclic.
 b. The angles of elevation of the top of a tower from the base and top of a building are 60° and 30° . The building is 20 meter high. Find the height of the tower.
50. a. Prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$ and hence deduce that $\lim_{\theta \rightarrow 0} \frac{\tan \theta}{\theta} = 1$.
 b. Find the total cost, average cost, total variable cost and average variable cost given that marginal cost $= 1 - 2x + 12x^3$ and fixed cost is Rs. 50.



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Mock Paper - 2 January - 2017
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PART A

I. Answer all the questions

1. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -2 \\ 5 \end{bmatrix}$, find AB.
2. In how many ways can 10 different precious stones be set to form necklace.
3. Negate the proposition $\approx p \rightarrow \approx q$
4. Find the value of x if $5:20=3:x$.
5. Define learning curve.
6. Express as product of 2 trigonometric functions $\cos 4x + \cos 2x$.
7. Find the equation of the circle center is at (-1,-2) and radius is 7 units.
8. Evaluate : $\lim_{x \rightarrow 0} \frac{\sin ax}{\sin bx}$ where a and $b \neq 0$
9. $X^e + e^x + e^e$ differentiate with respect to x.
10. $\int (7x - 3)^4 dx$.

II. Answer all the questions

11. If $\begin{bmatrix} x+3 & 3 \\ 4 & x-y \end{bmatrix} = \begin{bmatrix} 6 & 3 \\ 4 & 2 \end{bmatrix}$ find X and Y.
12. Find the number of diagonals of a polygon of 20 sides.
13. A committee of 4 has to be selected from 9 boys and 6 girls what is the probability that the committee contains 2 boys and 2 girls.
14. Write the converse and contra positive of the statement " if 2 triangles are similar then their areas are equal".
15. Find the ratio between two numbers such that their sum is 40 and their difference is 8.
16. 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% pa.
17. Ramu paid Rs.60 as sales tax on a titan raga watch worth Rs.1200. find the rate of sales tax.
18. Prove that : $\frac{\cos 2A - \cos 12A}{\sin 12A - \sin 2A} = \tan 7A$
19. Find the equation of the diameter of the circle $2x^2 + 2y^2 + 3x - 5y - 1 = 0$, which when produced passes through the point (-1,2).
20. Evaluate: $\lim_{x \rightarrow \infty} \frac{(2x-1)^{20} (3x-1)^{30}}{(2x+1)^{50}}$
21. Differentiate $\log(xy) = x^2 + y^2$ with respect to x.
22. Find the interval in which $f(x) = 5 + 36x + 3x^2 - 2x^3$ is increasing.
23. Integrate $\int_0^1 \frac{x}{x+1} dx$
24. Compute the total cost for the marginal cost function $f' = 12 + 6x - 6x^2$ assuming that the fixed cost is Rs.150.

III. Answer all the questions

25. Find x , if the matrix is singular $\begin{bmatrix} 2x & -9 \\ -4 & 5x \end{bmatrix}$
26. prove using property: $\begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = (x-y)(y-z)(z-x)(xy+yz+zx)$
27. A man has 10 relatives, 4 of them are ladies 3 men and 3 children. In how many ways can 7 relatives be invited for a dinner party so that there are exactly 2 men and 3 ladies?
28. A box contains 8 white chalks and 9 pink chalks. Two chalks are taken at a random from the box. Find the probability that both of them are pink
If
(i) 2 chalks are taken together.
(ii) Taken one after the other {without replacement}
(iii) Taken one after the other (with replacement)
29. In a fort there was ration for 560 soldiers that would last for 70 days. After 20 days 60 soldiers left the fort .For how many days can the remaining ration support the remaining soldiers?
30. A bill for Rs.2920 was drawn on September 11 for 3 months after date, and was discounted at 16% pa for Rs2875.20. on what date was the bill discounted.
31. A shopkeeper purchased an item of Rs100 at 8% vat, and sell it at Rs120 to a customer and the customer also pays 8% vat to the shopkeeper. How much amount did the shop keeper deposit to the govt as vat?
32. Find the coordinate of the focus, equation of the directrix and coordinate of latus rectum $y^2=16x$.
33. Differentiate with respect to x , $[x^2 e^{x^2} \cdot \log x]$
34. A spherical balloon is being inflated so that the volume is increasing at the rate of 30 cc/min. what is its rate of increase of area if the volume of the spherical balloon is 36π cc.
35. Find the maximum and minimum value of $f(x)=x^5-5x^4+5x^3-1$.
36. integrate: $\int x \cdot \log x \, dx$
37. integrate $\int \frac{1}{x[(\log x)^2 - 3\log x + 2]} \, dx$

IV. Answer all the questions

38. If $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & 2 \\ 1 & -1 & 1 \end{bmatrix}$, then verify $A \cdot \text{adj}A = \text{adj}A \cdot A = |A| I$.
39. Find the middle term in the expansion of $(2x - \frac{1}{x})^{17}$.
40. Solve : $\frac{2x^2 + 16x + 29}{(x+3)^2(x+4)}$ by partial fractions
41. Construct the truth table for $(p \rightarrow q) \wedge r$.
42. 8 men and 16 boys can finish a job in 6 days, but 12 men and 24 boys can finish the same job in 8 days. How many days will 16 men and 20 boys take to finish the same job?
43. A production manager of a company obtained the following equation for the learning effect $y=1356 X^{-0.3219}$. this function is based on the company's experience for assembling the first 50 units of the product find the labour hours required to assemble 100 units.
44. Solve graphically: maximum $Z=5x+3y$

$$4x+2y \leq 20, 2x+5y \leq 50, x \geq 0, y \geq 0.$$

45. if $y = (x + \sqrt{x^2 + 1})^m$ show that $(x^2 + 1)y_2 + xy_1 - m^2 y = 0$.

46. if $A+B+C=180^\circ$. prove that $\sin 2A - \sin 2B + \sin 2C = 4 \cos A \sin B \cos C$.

47. Find the area of the region included between the curve $4y=3x^2$ and the line $3x-2y+12=0$.

V. Answer all the questions

48.

a. if θ angle is in radians, then prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$, and also deduce $\lim_{-\theta \rightarrow 0} \frac{\sin(-\theta)}{-\theta} = 1$.

b. using binomial theorem evaluate $(98)^5$.

49.

a. find the equation of tangent of the circle $x^2+y^2+2x+4y-4=0$ which is parallel to the line $5x+12y+6=0$.

b. An aeroplane when flying at a height of 2000mts passes vertically above another plane at an instant when their angle of elevation from the same point, are 60° and 45° respectively. Find the distance between the two planes.