JAIN COLLEGE

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Bangalore - 560 098

Date: / /2018 ***SUBJECT: BASIC MATHEMATICS***

II PUC
MOCK I

Timings Allowed: 3Hrs 15Mins ***Total Marks:100***

Instructions:
1. The question paper has 5 parts A,B,C,D,E. Answer All parts
2. Part-A carries 10 marks , Part-B carries 20 marks, Part-C and Part-D carries 30 marks and Part-E carries 10 marks.

PART-A

I. Answer ALL the questions. **1X10=10**

1. $If\ A = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}\ find\ A - A^1$
2. Find the value of n if $nP_3 = 210$
3. Negate the following proposition $\sim p \rightarrow \sim q$.
4. Find the compound ratio of 3:4 and 4:7
5. Find the income obtained by investing Rs.3600 in 5% stock at 90.
6. If $SinA = \frac{1}{2}\ find\ \ Sin2A.$
7. Find the radius of a circle $x^2 + y^2 - 2x\ Cos\alpha - 2y\ Sin\alpha = 1$
8. Evaluate $\lim_{x\to 1}\left(\frac{x^3-1}{x-1}\right)$
9. Differentiate $5e^x - logx - 3\sqrt{x}$
10. Integrate Cot^2x

PART-B

II. Answer any TEN questions. **2X10=20**

11. If $A = \begin{bmatrix} 3 & 2 \\ 4 & 1 \end{bmatrix}\ prove\ that\ A^2 - 4A - 5I = 0\ where\ I\ is\ the\ identity$ matrix of order 2X2.
12. In how many ways can 6 people be choosen out of 10 people if one particular person is always included.
13. Find the probability of getting both face cards in the selection of two cards from a pack of 52 cards.
14. If the compound proposition $\sim(p \rightarrow q)\text{^}(p\text{^}r)$ is true then find the truth values of p,q, and r
15. Two numbers are in the ratio 3:5 if 5 is added to each, they are in the ratio 2:3 find the numbers.
16. True discount on a bill was Rs. 100 and Banker's discount was Rs. 10.m What is the face value of the bill?
17. If $CotA = \frac{12}{5}\ and\ A\ is\ an\ acute\ angle\ find\ \ Sin3A$
18. Show that $Sin(A+B)Sin(A-B) = Sin^2A - Sin^2B$
19. Find the equation of the parabola given that focus is (0,-3) and directrix y=3
20. Evaluate $\lim_{x\to 0}\frac{Sin3x+7x}{4x+Sin2x}$
21. Find $\frac{dy}{dx}\ if\ \ x = aCos\theta,\quad y = aSin\theta$
22. Find a point on the parabola $y^2 = 4x$at which the ordinate increases at twice the rate of the abscissa.
23. Evaluate $\int Cos^3x\,dx$
24. Evaluate $\int_0^1\left(2x^2 + \frac{1}{x}\right)dx$

PART-C

III. Answer any TEN questions. **3X10=30**

25. Verify $A(adjA) = (adjA)A = |A|I\ \ if\ A = \begin{bmatrix} 2 & 3 \\ -4 & -6 \end{bmatrix}$
26. Find the adjoint of the matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & 2 & 1 \\ -4 & 5 & 2 \end{bmatrix}$

27. A family of 4 brothers and 3 sister is to be arranged for a photograph in one row. In how many ways can they be seated if
    a) All sisters sit together
    b) No two sisters sit together.
28. Monthly income of A and B are in the ratio 2:3 and their monthly expenditure are in the ratio 3:5. If each save Rs. 100 per month. Find monthly income of A and B.
29. A couple has 2 children. Find the probability that both are boys if it is known that a) one of the children is boy b). Elder one is boy
30. A bill for Rs. 2920 drawn at 6 months was discounted on 10 - 4 – 97 for Rs. 2916. If the discount rate is 5% p.a. on what date bill was discounted.
31. What is the market value of 6% stock if it earns an investment of 4.5% after deducting the income tax of 4%.
32. Differentiate e^x by first principles.
33. Find the equation of the parabola if the vertex is at origin and axis is along x-axis and passing through the point (2,3)
34. If $x = e^{\log cos4\theta}$ $y = e^{\log Sin4\theta}$ $show\ that\ \frac{dy}{dx} = -\frac{x}{y}$
35. A particle moves according to the law $S = t^3 + at^2 + bt$. Find a and b if the initial velocity is 5 units, when t=1 sec it moves with a velocity 4 times initial velocity.
36. Find the value of x at which the function $y = 2x^3 - 21x^2 + 36x - 20$ is maximum.
37. Evaluate $\int \frac{3\,dx}{x(2+logx)^{\frac{2}{3}}}$
38. Evaluate $\int_0^{\frac{\pi}{2}} xSinx\,dx$

PART-D

IV. Answer any SIX questions. 6 X 5=30

39. Find the middle term in expansion of $\left(2x - \frac{1}{x}\right)^{17}$
40. Resolve into partial fractions $\frac{3x+5}{(x+2)(x-3)(x+1)}$
41. Show that the following composition is logically equivalent $p\hat{}(q\hat{}r) \equiv (p\hat{}\sim q)v(p\hat{}\sim r)$
42. Two taps can fill a cistern separately in 20 minutes and 40 minutes respectively and drain pipe can drain off 30 litres per minute. If all the three pipes are opened, the cistern fills in 72 minutes. What is the capacity of the cistern.
43. An engineering company has 80% learning effect and spends 1000 hours to produce 1 lot of the product. Estimate the labour cost of producing 8 lots of the product if the labour cost is Rs. 40 per hour.
44. Solve graphically. Maximize Z=60 x + 15 y subject to x + y$\leq$ 50 $3x + y \leq 90$, $x, y \geq 0$
45. Prove that $\frac{Cos7x+Cos3x-cos5x-cosx}{Sin7x-Sin3x-Sin5x+Sinx} = Cot2x$
46. A circle has the radius 3 units and its centre lies on the line y=x-1 find the equation of the circle if it passes through (7, 3).
47. Differentiate $x^{\left(1+\frac{1}{x}\right)} + \left(1 + \frac{1}{x}\right)^x$ w.r.t. x
48. Find the area of the region between the curves $y^2 = 4ax\ and\ x^2 = 4ay$

PART-E

V. Answer any ONE question 1 X 10 =10

49. (a)Evaluate $\lim_{\theta\to 0} \frac{sin\theta}{\theta} = 1$ .Hence deduce $\lim_{\theta\to 0} \frac{tan\theta}{\theta} = 1$

    (b)Find total revenue obtained by raising the output from 10 to20 units where the marginal revenue function is given by MR=$3\left(\frac{x^2}{20}\right) - 10x + 100$ (x is output)

50. (a) Show that the points are con-cyclic (0,0),(1,1),(5,-5),(6,-4)

    (b) The angle of elevation of an object from a point 100m above a lake is 30^0 and angle of depression of its image in the lake is 45^0. Find the height of the object above the lake.