



SRI BHAGAWAN MAHAVEER JAIN COLLEGE

Vishweshwarapuram, Bangalore.

Mock 1 Examination – January 2020

Course: II PUC

Subject: Basic Mathematics

Max. Marks: 100

Duration: 3:15

Instructions:

- (i) The question paper has 5 parts A,B,C,D and E. Answer all parts.
- (ii) Part A carries 10 marks, Part B carries 20 marks, Part C carries 30 marks, Part D carries 30 marks and Part E carries 10 marks.
- (iii) Write all the question paper number properly as indicated in the question paper.

PART-A

I Answer all the Ten questions:

10 x 1 = 10

- 1 If $A = \begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix}$ and $B = [1 \ 4 \ 2]$. Find BA.
- 2 Find the number of diagonals in a decagon.
- 3 Negate the proposition “4 is an even integer or 7 is a prime number.”
- 4 Find the third proposition of 3 and 12.
- 5 Find the index of learning for 70% learning effect.
- 6 If $\cos A = \frac{\sqrt{3}}{2}$. Find $\cos 2A$.
- 7 Find the center of the circle $x^2 + y^2 - 4x - y - 5 = 0$.
- 8 Evaluate $\lim_{x \rightarrow 0} (1 + 3x)^{1/x}$.
- 9 Find $\frac{dy}{dx}$. If $y = e^{2x} \cdot \sin 3x$
- 10 Evaluate: $\int \sec x (\sec x - \tan x) dx$.

PART-B

II Answer any TEN questions:

10 x 2 = 20

- 11 Solve by Cramer’s rule: $3x + 4y = 7$ and $7x - y = 6$.
- 12 Find the number of straight lines and triangles that can be formed out of 12 points of which 5 are collinear.
- 13 Tickets are numbered from 1 to 18 are mixed up together and one ticket is drawn at random. What is the probability that the ticket has a number which is a multiple of 2 or 3.
- 14 If $(\sim p \vee q) \wedge \sim r$ is a false proposition then find the truth values of p, q and r.

- 15 A mixture contains milk and water in the ratio 6:1 on adding 5 litres of water, the ratio of milk and water becomes 7:2. Find the quantity of milk in the original mixture.
- 16 The present worth of a bill due sometimes hence is ₹1100 and T D on the bill is ₹110. Find BD and BG.
- 17 Prove that $\frac{\sin 2\theta}{1+\cos 2\theta} = \tan\theta$.
- 18 Prove that $\frac{\cos 2A}{\sec A} + \frac{\sin 2A}{\operatorname{cosec} A} = \cos A$.
- 19 Find the equation of the parabola given that its vertex is (0, 0) and directrix is $y = -3$.
- 20 Show that the function $f(x) = \begin{cases} \frac{x^2 - 9}{x - 3} & \text{when } x \neq 3 \\ 4 & \text{when } x = 3 \end{cases}$ is discontinuous at $x = 3$.
- 21 If $x = e^{\log \cos 4\theta}$, $y = e^{\log \sin 4\theta}$. Show that $\frac{dy}{dx} = \frac{-x}{y}$.
- 22 If the sum of two numbers is 48. Find the numbers whose product is maximum.
- 23 Evaluate: $\int \frac{\sin^2 x}{1+\cos x} dx$.
- 24 Compute the total cost for the marginal cost function $f'(x) = 6x^2 - 6x + 12$ assuming that the fixed cost is ₹500.

PART-C

III Answer any TEN questions:

10 x 3 = 30

- 25 If $A = \begin{bmatrix} 2 & -3 \\ 1 & 6 \end{bmatrix}$. Verify $\operatorname{adj}(AB) = \operatorname{adj} B \cdot \operatorname{adj} A$.
- 26 Prove that $\begin{vmatrix} 1 & 1 & 1 \\ b & c & a \\ b^2 & c^2 & a^2 \end{vmatrix} = (a-b)(b-c)(c-a)$.
- 27 How many 5 digit numbers can be formed using the digits 1, 2, 3, 5, 7, 8, 9 (no digits being repeated).
How many of these are (i) divisible by 5 (ii) less than 50,000 (iii) greater than 75,000
- 28 A bag contains 8 red and 4 green balls. Find the probability that
(i) ball drawn is red when one ball is selected at random.
(ii) two balls are red and one ball is green when three balls are drawn at random,
(iii) three balls are drawn and none of them is green.

- 29 Rajeev planned his journey to Mumbai as follows. He will travel $\frac{5^{\text{th}}}{9}$ of the total distance by an aeroplane $\frac{3^{\text{th}}}{4}$ of the remainder by train and the remaining distance 200km by a car. What is the total distance to Mumbai?
- 30 A bill for ₹14,600 drawn at 3 months after date was discounted on 11-11-99 for ₹14,320. If the discount rate is 20% p.a., on what date was the bill drawn?
- 31 A man sells ₹25,000, 13.5% stock when the shares were selling at a premium ₹20. He invests the proceeds partly in 15% stock at ₹75 and partly in 16% stock at 128. Find how much he has invested in each stock if his income increased by ₹1875.
- 32 Sanju goes to a shop to buy a bicycle quoted at ₹2000. The rate of sales tax is 12% on it. He asks the shop keeper for a rebate on the price of the bicycle to such an extent that he has to pay ₹2016 inclusive of sales tax. Find the rebate percentage on the price of the bicycle.
- 33 The angles of elevation of the top of a tower from two points distant a and b ($a < b$) for its foot and the same straight line from it are 30° and 60° . Show that the height of the tower is \sqrt{ab} .
- 34 Find the focus, equation of directrix and length of latus rectum of $x^2 + 16y = 0$.
- 35 Differentiate x^n with respect to x from the first principles.
- 36 A man 2 meter height walks at a uniform speed of 6km / hour away from the lamp post 6 meter high. Find the rate at which the (i) length of his shadow increases (ii) the rate at which the tip of the shadow is moving.
- 37 Integrate $x^2 \cos x$ with respect to x.
- 38 Evaluate : $\int_0^1 \frac{2x+5}{x^2+5x+3} dx$.

PART-D

IV Answer any SIX questions:

6 x 5 = 30

- 39 Solve by matrix method
 $x - y + z = 2, \quad 2x - y = 0, \quad 2y - z = 1$
- 40 Find the term independent of x in the expansion of $\left(x^3 - \frac{3}{x^2}\right)^{15}$.
- 41 Resolve $\frac{2x^2 - 7x + 1}{x^2 - 3x - 4}$ into partial fraction.
- 42 Verify whether the proposition $(p \rightarrow q) \leftrightarrow (\sim q \rightarrow \sim p)$ is a tautology, contradiction or neither.
- 43 The monthly incomes of A and B are in the ratio 9:7 and those of B and C are in the ratio 3:2. If 10% of A's income and 15% of C's income differ by ₹18. Find the incomes of A, B and C.
- 44 A motor company Ltd., has observed that a 90% learning effect applies to all labour related costs. Whenever a new product is taken up for production, the anticipated production to 320 units for the

coming year. The production is done in lots of 10 units each. Each lot requires 1000 hours at ₹15 / hour. Calculate the total labour hours and labour cost to manufacture 320 units.

45 Solve the following L.P.P graphically Maximize $Z = 60x + 40y$ subject to $x \leq 25$, $y \leq 35$, $2x + y \leq 60$, $x \geq 0$, $y \geq 0$.

46 Prove that $\cos 10^\circ \cdot \cos 30^\circ \cdot \cos 50^\circ \cdot \cos 70^\circ = \frac{3}{16}$.

47 If $y = a \cos(\log x) + b \sin(\log x)$. Show that $x^2 y_2 + x y_1 + y = 0$.

48 Find the area enclosed between the parabola $x^2 = 4y$ and the line $x = 4y - 2$.

PART-E

V Answer any ONE questions:

1 x 10 = 10

49 a) If angle θ is measured in radians, then prove that

$$\lim_{\theta \rightarrow 0} \left(\frac{\sin \theta}{\theta} \right) = 1 \text{ and hence deduce } \lim_{\theta \rightarrow 0} \left(\frac{\tan \theta}{\theta} \right) = 1. \quad 6$$

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

50 a) Show that the points (2, -4), (3, -1), (3, -3), (0, 0) are concyclic. 6

b) The total revenue function is given by $R = 400x - 2x^2$ and the total cost function is given by $C = 2x^2 + 40x + 4000$. Find (i) the marginal revenue and marginal cost function.

(ii) the average revenue and average cost. 4
