



M - 2017

Subject Code : 75 (NS)

0612952

BASIC MATHEMATICS

(Kannada and English Versions)

Time : 3 Hours 15 Minutes]

[Total No. of questions : 50]

[Max. Marks : 100

(English Version)

- Instructions :** 1. The question paper has 5 parts A, B, C, D and E. Answer all the Parts.
2. 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.
3. Write the question number properly as indicated in the question paper.

PART – AI. Answer all the **ten** questions :**(10 × 1 = 10)**

1) If $A = \begin{bmatrix} 1 & -3 & 5 \\ 6 & 2 & 4 \end{bmatrix}$ find $5A'$.

2) If ${}^n P_4 = 360$, find n .

3) Symbolise the propositions " $3x = 9$ and $x < 7$ ".

4) If $5 : 20 = 3 : x$, find the value of x .

5) What rate of interest is obtained by investing in 9% stock at 180?

6) If $\sin A = \frac{3}{5}$, find $\sin 3A$.

7) Find the length of Latus Rectum of the parabola $3x^2 + 8y = 0$.



8) Evaluate : $\lim_{x \rightarrow -3} \left(\frac{x^3 + 27}{x + 3} \right)$.

9) If $y = e^{\log \cot x}$, find $\frac{dy}{dx}$.

10) Evaluate $\int \sec x(\sec x - \tan x) dx$.

PART - B

II. Answer **any ten** questions :

(10 × 2 = 20)

11) If $A = \begin{bmatrix} -4 & -3 \\ -2 & -1 \end{bmatrix}$, find A^{-1} .

12) In how many ways can 6 people be selected out of 12 people so that

- i) two particular members must be included.
- ii) two particular members must be excluded.

13) If $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cup B) = \frac{7}{12}$. Find $P(B/A)$.

14) Write the converse and the contra positive of "If $x < 1$ then it is a prime number".

15) Two numbers are in the ratio 3 : 5. If 5 is added to each of them, the new ratio will be 2 : 3. Find the numbers.



16) Banker's discount and Banker's gain on a certain bill due after sometime are ₹ 1,250 and ₹ 50 respectively. Find the face value of the bill.

17) Prove that $\sin 2A = \frac{2 \tan A}{1 + \tan^2 A}$.

18) Show that $\cos\left(\frac{\pi}{4} - \alpha\right) - \cos\left(\frac{\pi}{4} + \alpha\right) = \sqrt{2} \sin \alpha$.

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 $f(x) = \begin{cases} \frac{e^{2x} - 1}{x}, & x \neq 0 \\ K, & x = 0 \end{cases}$ is continuous at $x = 0$.

21) If $y = x^{\sin x}$, find $\frac{dy}{dx}$.

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

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

24) Evaluate $\int_1^2 (x^3 + e^x) dx$.



PART – C

III. Answer any ten questions :

(10 × 3 = 30)

25) If $A = \begin{bmatrix} 2 & -1 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & 2 \\ -1 & 4 \end{bmatrix}$ show that $(AB)' = B'A'$.

26) Prove that "If each element of any row (or column) of a determinant is the sum of two terms, then the determinant can be expressed as the sum of two determinants".

27) Find the number of permutations of the letters of the word 'UNIQUE'.

- i) How many of them end with 'QUE'?
- ii) How many begin with 'U' and end with 'E'?
- iii) How many of them begin with a consonant?

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

- i) with replacement
- ii) without replacement.

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

30) Banker's gain on a bill due 6 months at 4% p.a is ₹ 20. Find the true discount, banker's discount and bill amount.



- 31) A man invests equal sums of money in 4%, 5% and 6% stock, each stock being at par. If the total income of the man is ₹ 3,600, find his total investment.
- 32) A shopkeeper announces a discount of 10% on a washing machine set. The marked price of washing machine is ₹ 12,000. How much will a customer have to pay for buying the washing machine set if the rate of sales tax is 8%?
- 33) Find equation of the parabola whose vertex is at (0, 0), axis is y axis and passes through $\left(\frac{1}{2}, 2\right)$. Also find equation of directrix.
- 34) If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ then prove that $\frac{dy}{dx} = \cot \frac{\theta}{2}$.
- 35) The surface area of a spherical soap bubble increasing at the rate of $0.6 \text{ cm}^2/\text{sec}$. Find the rate at which its volume is increasing when its radius is 3 cm.
- 36) Find the maximum or minimum value of the function $f(x) = 9x^2 + 12x + 2$.
- 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 questions :

(6 × 5 = 30)

39) Find the middle terms in the expansion of $\left(3x - \frac{2}{x^2}\right)^{15}$.

40) Resolve into partial fractions : $\frac{3x+2}{(x+3)^2(x-2)}$.

41) Verify if the proposition $[\sim p \wedge (p \vee q)] \rightarrow q$ is a tautology, contradiction or neither.

42) ₹ 5,625 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) A company has 80% learning effect and spends 500 hours for the prototype. Estimate the labour cost of producing 7 engines of new order if the labour cost is ₹ 40 per hour.

44) Solve the LPP graphically

Maximise : $Z = 5x + 3y$

Subject to $3x + 5y \leq 15$

$5x + 2y \leq 10$

$x \geq 0, y \geq 0.$

45) In any ΔABC , prove that

$\sin 2A + \sin 2B - \sin 2C = 4 \cos A \cos B \sin C,$



- 46) Find the equation of the circle passing through the point $(1, -4)$ and $(5, 2)$ and has its centre on the line $x - 2y + 9 = 0$.
- 47) If $y = \log(x - \sqrt{x^2 + 1})$ show that $(x^2 + 1)y_2 + xy_1 = 0$.
- 48) Find the area enclosed between the parabola $4y = 3x^2$ and the line $3x - 2y + 12 = 0$.

PART - E

V. Answer **any one** question :

(1 × 10 = 10)

- 49) a) A sales person's sales details are given below.

Months	Sales in Units			Profit in ₹
	Pen	Book	Bag	
January	9	10	2	800
February	15	5	4	900
March	6	10	3	850

Find profit for each Pen, Book and Bag using matrix method. (6)

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

- 50) a) If θ is measured in radians, then prove that $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$. (6)

- b) The angles of elevation of the summit of a hill from the top and the bottom of a building are 30° and 60° respectively. If the height of the building is ' h ' m, show that the height of the hill is $\frac{3h}{2}$. (4)