



M – 2019

Subject Code : 75 (NS)

2683820

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 – A

I. Answer all the **ten** questions :

(10 × 1 = 10)

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

2) In how many ways can 10 people be seated around a table?

3) Symbolise the proposition :

“If Oxygen is a gas then gold is a compound”.

4) Find the triplicate ratio of 5 : 4.

5) Find the income obtained by investing ₹ 3,600 in 5% stock at 90.

6) Express $\sin 5A \cos 3A$ as sum or difference of two trigonometric functions.

7) Find the centre of the circle $x^2 + y^2 - 4x - y - 5 = 0$.



8) Evaluate : $\lim_{x \rightarrow 3} \left(\frac{x^2 - 4x}{x - 2} \right)$.

9) Differentiate $(5e^x - \log x - 3\sqrt{x})$ with respect to x .

10) Integrate $\left(x^2 - \frac{6}{x} + 5e^x \right)$ with respect to x .

PART - B

II. Answer **any ten** of the following questions :

(10 × 2 = 20)

11) If $A = \begin{bmatrix} 1 & 3 & -1 \\ -1 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -1 & 2 \\ 1 & 3 & -2 \end{bmatrix}$ then, find $A - 3B$.

12) In how many ways the word "CARROM" be arranged such that the 2R'S are always together?

13) A box contains 8 red marbles 6 green marbles and 10 pink marbles. one marble is drawn at random from the box. What is the probability that the marble drawn is either red or green?

14) If the truth values of the propositions p, q, r are T, T, F respectively, then find the truth values of $p \rightarrow (q \wedge r)$.

15) What must be added to each term in the ratio 5 : 6 so that it becomes 8 : 9?



16) True discount on a bill was ₹ 900 and Banker's gain was ₹ 27. What is the face value of the bill?

17) Find the value of $\cos 15^\circ$.

18) If $\tan A = \frac{1}{2}$, $\tan B = \frac{1}{3}$, then find $\tan(A+B)$.

19) Find the equation of parabola whose vertex is (0,0) and focus is (3, 0).

20) Verify whether function $f(x) = \begin{cases} x^2 - 1 & x \leq 1 \\ -x^2 - 1 & x > 1 \end{cases}$ is continuous or not at $x = 1$.

21) If $y = (a^2 - x^2)^{10}$, find $\frac{dy}{dx}$.

22) If the cost function of a firm is given by $C(x) = x^3 - 3x + 7$. Find the average cost and marginal cost.

23) Evaluate : $\int \frac{4x+3}{2x^2+3x+5} dx$.

24) Evaluate : $\int_1^2 x e^x dx$.



PART – C

III. Answer **any ten** of the following questions :

(10 × 3 = 30)

25) If $A = \begin{bmatrix} 2 & 3 \\ -4 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 5 \\ 6 & 2 \end{bmatrix}$ show that $(AB)' = B' A'$.

26) Prove that : $\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} = 1+a+b+c$.

27) From a class of 9 boys and 7 girls 12 students are to be chosen for a competition which includes atleast 6 boys and atleast 4 girls. In how many ways can this be done if a particular boy is always chosen?

28) A couple appears in an interview for two vacancies in the same post. The probability of husband getting selected is $\frac{1}{7}$ and the probability of wife getting selected is $\frac{1}{5}$. What is the probability that

- a) both of them will be selected?
- b) only one of them will be selected?
- c) none of them will be selected?

29) In a Fort, there was ration for 560 soldiers that would last the soldiers for 70 days after 20 days, 60 soldiers left the fort. For how many days the remaining ration can support the remaining soldiers?

30) For ₹ 512.50 due 6 months at 15% p.a. Find the true present value and discounted cash value.



- 31) Sanjana invests ₹ 3240 in a stock at 108 and sells when price falls to 104. How much stock at 130 can sanjana now buy?
- 32) Sanju goes to a shop to buy a bicycle quoted at ₹ 2,000. The rate of sales tax is 12% on it. He asks the shopkeeper 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) Find the equation of parabola when vertex is (0, 0) and axis is y -axis and passes through the point $(-1, -3)$.
- 34) Differentiate $y = \frac{e^x - 1}{e^x + 1}$ with respect to x .
- 35) Find the maximum and minimum value of $y = x^3 - 9x^2 + 15x - 1$.
- 36) A square plate is expanding uniformly, the side is increasing at the rate of 5 cm/sec what is the rate at which the area and its perimeter is increasing when the side is 20 cm long?
- 37) Integrate $x^2 \sin x$ with respect to x .
- 38) Evaluate : $\int (2x+3)(x^2+3x+5)^{3/2} dx$.

PART - D

IV. Answer **any six** questions :

(6 × 5 = 30)

- 39) Find the middle term in the expansion of $\left(\frac{2x^2}{3} - \frac{3}{2x}\right)^{10}$.
- 40) Resolve $\frac{x-1}{x(x+2)(x+4)}$ into partial fractions.
- 41) Verify whether the proposition $(\sim p \wedge q) \wedge \sim r$ is a tautology or a contradiction or neither.
- 42) Walking 4 kmph a student reaches his college 5 minutes late and if he walks at 5 kmph he reaches $2\frac{1}{2}$ minutes early. What is the distance from his house to the college?
- 43) 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.
- 44) Solve the following LPP graphically :
- Maximise $Z = 60x + 15y$
- Subjected to the constraints : $x + y \leq 50$
 $3x + y \leq 90$
 and $x, y \geq 0$.
- 45) If $A + B + C = 180^\circ$, then prove that $\sin 2A + \sin 2B + \sin 2C = 4 \sin A \sin B \sin C$.
- 46) Find the equation of the circle passing through the points (5, 3), (1, 5) and (3, -1).



47) If $y = \log(x + \sqrt{x^2 + 1})$ show that $(x^2 + 1)y_2 + xy_1 = 0$.

48) Find the area bounded by the parabola $y^2 = 4x$ and the line $x = y$.

PART - E

V. Answer **any one** of the following questions :

(1 × 10 = 10)

- 49) a) A sales person Samanth has the following record of sales. He is paid a commission at fixed rate per unit but varying rates for products P, Q and R. (6)

| Months | Sale in units | | | Commission in ₹ |
|----------|---------------|----|---|-----------------|
| | P | Q | R | |
| January | 9 | 10 | 2 | 780 |
| February | 15 | 5 | 4 | 900 |
| March | 6 | 10 | 3 | 820 |

Find the rate of commission payable on P, Q and R per unit sold.

- b) Find the value of $(1.2)^5$ using Binomial theorem upto 4 places of decimals. (4)
- 50) a) If 'n' is a rational number and 'a' is a non zero real number, then prove that $\lim_{x \rightarrow a} \left(\frac{x^n - a^n}{x - a} \right) = n a^{n-1}$. (6)
- b) A person standing on the bank of a river observes that the angle subtended by a tree on the opposite bank is 60° . When he returns 80 mts from the bank he finds the angle to be 30° . Find the height of the tree and the width of the river. (4)