



M - 2018

Subject Code : 75 (NS)

2646252

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 $A = \begin{bmatrix} 2 & 4 \\ 3 & -1 \\ 4 & 0 \end{bmatrix}$ show that $(A')' = A$.

2) How many different 4 digit number can be formed using the digits 1, 2, 4, 5, 7, 8, 9. No digit being repeated.

3) Symbolise the proposition :
"2 + 5 = 6 or all integers are rationals"

4) Find the duplicate ratio of 5 : 3.

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

6) If $\sin A = \frac{3}{5}$, find $\sin 2A$.

7) Find the equation of directrix for a given parabola $x^2 = 6y$.



8) Evaluate : $\lim_{x \rightarrow 0} \frac{\sin ax}{bx}$.

9) If $y = 5a^x - \log x - 3\sqrt{x}$ find $\frac{dy}{dx}$.

10) Evaluate : $\int \frac{1}{5e^{-x}} dx$.

PART - B

II. Answer **any ten** questions :

(10 × 2 = 20)

11) Solve by Cramer's rule $3x + 4y = 7$ and $7x - y = 6$.

12) Find n , if ${}^n P_3 = 210$.

13) Two dice are thrown at once. What is the probability of getting face upwards with "sum equal to 4 or 5".

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

15) Monthly income of A and B are in the ratio $2:3$ and their monthly expenditure are in the ratio $3:5$. If each saves ₹ 100 per month. Find the monthly incomes of A and B .



16) A bill drawn for 3 month was legally due on 06.07.2018 . Find the date of drawing of the bill.

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

18) Show that $\tan(45^\circ + A) \tan(45^\circ - A) = 1$.

19) Find the equation of parabola given that vertex is origin (0,0) and passing through the point $P(5, 2)$ and symmetric with respect to the y -axis.

20) Find K for which $f(x) = \begin{cases} K + x, & x = 1 \\ 4x + 3, & x \neq 1 \end{cases}$ is continuous at $x = 1$.

21) Find $\frac{dy}{dx}$, if $y = \sqrt{x + \sqrt{x + \sqrt{x + \dots \infty}}}$.

22) If $S = 5t^2 + 4t - 8$. Find the initial velocity and acceleration.

23) Evaluate : $\int (4x^2 - 2x + 7)^{3/2} (4x - 1) dx$.

24) Evaluate : $\int_1^2 \frac{1}{x} dx$.



PART - C

III. Answer any ten questions :

(10 × 3 = 30)

25) If $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ show that $A(\text{adj } A) = (\text{adj } A)A = |A|I$.

26) Show that $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = 4a^2b^2c^2$.

27) A team of 11 is to be chosen from 18 cricketers of whom 6 are bowlers and 3 are wicket keepers. In how many ways can a team be chosen so that

- i) There are exactly 4 bowlers and one wicket keeper
- ii) There are atleast 4 bowlers and atleast 2 wicket keepers.

28) If A and B are event with $P(A) = \frac{5}{8}$, $P(B) = \frac{3}{8}$ and $P(A \cup B) = \frac{3}{4}$ find

- i) $P(B/A)$
- ii) $P(A/B)$.

29) Two taps can separately fill a tank in 12 min and 15 minutes respectively. The tank when full can be emptied by a drain pipe in 20 minutes. When the tank was empty, all the three were opened simultaneously. In what time will the tank be filled up?

30) The banker's gain on a bill is $\frac{1}{5}$ th of the banker's discount and the rate of interest is 20% p.a. Find the unexpired period of the bill.



- 31) Rakshith decides to invest in TCS shares which are selling at ₹ 2,020 per share. How much money is required to purchase 10 shares, if the brokerage is 0.5%.
- 32) The price of a washing machine inclusive of sales tax is ₹ 13,530. If the sales tax is 10%. Find the basic price.
- 33) Find the length of the chord of the circle $x^2 + y^2 - 6x - 4y - 12 = 0$ on the coordinate axes.
- 34) If $x = a \sec \theta$, $y = b \tan \theta$ find $\frac{dy}{dx}$ at $\theta = \frac{\pi}{4}$.
- 35) The volume of a sphere is increasing at the rate 4π cc/sec. Find the rate at which the area of its surface increases when its radius is 10 cm.
- 36) Show that x^x is minimum at $x = \frac{1}{e}$.
- 37) Evaluate : $\int x^2 \log x \, dx$.
- 38) Evaluate : $\int \operatorname{cosec} x [\operatorname{cosec} x + \cot x] \, dx$.



PART - D

IV. Answer any six questions :

(6 × 5 = 30)

39) Evaluate $(2 + \sqrt{3})^5 + (2 - \sqrt{3})^5$.

40) Resolve into partial fractions : $\frac{3x + 5}{(x + 2)(x - 1)^2}$.

41) Verify whether the compound proposition $p \rightarrow (\sim p \vee q)$ is a tautology or a contradiction or neither.

42) If two men or four women can do a work in 33 days and 3 men and 5 women can do the same work in 24 days? How long shall 5 men and 2 women take to do the same work?

43) Samsung company which manufacture LCD TV. The 1st lot of 10 units was completed in 1,400 labour hours. Find each subsequent lot, the commutative production was doubled. And it has observed that 90% learning effect applies to all labour related cost. The anticipated production is 320 units of LCD TV find total labour cost required to manufacture 320 unit and also find the total labour cost at ₹ 20/hrs.

44) Solve the LPP graphically :

$$Z = 3x + 5y$$

$$\text{Subject to : } x + 3y \leq 3$$

$$x + y \leq 2$$

$$x, y \geq 0.$$

45) In any triangle ABC, 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 points $(0, 2)$, $(3, 0)$ and $(3, 2)$.
- 47) If $y = a \cos(\log x) + b \sin(\log x)$. P.T $x^2 y_2 + xy_1 + y = 0$
- 48) Find the area enclosed between the curves $y^2 = x$ and $x^2 = y$.

PART – E

V. Answer **any one** question :

(1 × 10 = 10)

- 49) a) A school wants to award its students for the values of punctuality, good behaviour and hard work with a total cash award ₹6,000. Three time the award money for hard work together with the award money for punctuality is ₹ 11,000. The award money for punctuality and hard work together is double the one given for Good Behaviour. Represent the above situation algebraically and also find the award money for each value. Using matrix method. (6)
- b) Find the value of $(1.01)^5$ using Binomial upto 4 decimal places. (4)
- 50) a) If n is a rational number and 'a' is non-zero real number, then prove that $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n a^{n-1}$. (6)
- b) The angles of depression of two boats as observed from the mast head of a ship 50 m high are 45° and 30° . What is the distance between the boats if they are on the same side of the mast head in line with it? (4)
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