II PUC BASIC MATHEMATICS (CODE - 75)

BLUE PRINT

Unit	Title of the chapter	No. of teaching hours	Part A	Part B	Part C	Part D	Part E		Total Marks
			1 Mark	2 Mark	3 Mark	5 Mark	4 Mark	6 Mark	
UNIT - I	ALGEBRA (42 hrs)								
	Matrices & Determinants	13	2	1	2	1	-	-	15
	Permutations & Combinations	08	2	1	1	-	-	-	07
	Probability	05	1	1	1	-	-	-	06
	Binomial Theorem	06	-	-	-	1	1	-	09
	Partial Fraction	04	-	-	-	1	-	-	05
	Mathematical Logic	06	2	1	-	1	-	-	09
UNIT - II	COMMERCIAL ARITHMETIC (34 hrs)								
	Ratios & Proportions	10	2	1	1	1	-	-	12
	Bill Discounting	06	1	1	1	-	-	-	06
	Stocks & Shares	04	1	-	1	-	-	-	04
	Learning Curve	04	1	-	-	1	-	-	06
	Linear Programming Problem	06	-	-	-	1	-	-	05
	Sales Tax & Value Added Tax	04	1	-	1	-	-	-	04
UNIT - III	TRIGONOMETRY (12 hrs)								
	Heights & Distances	04	-	-	-	-	1	-	04
	Compound angle, multiple angle, sub multiple angle & transformation formulae	08	1	2	-	1	-	-	10
UNIT - IV	ANALYTICAL GEOMETRY (10 hrs)								
	Circles	06	1	-	-	-	-	1	07
	Parabola	04	1	1	1	-	-	-	06
UNIT - V	CALCULUS (42 hrs)								
	Limits & continuity of a function	08	1	1	-	-	-	1	09
	Differential Calculus	10	1	1	1	1	-	-	11
	Application of Derivative	08	1	1	2	-	-	-	09
	Indefinite Integrals	08	1	1	2	-	-	-	09
	Definite Integrals & its Application to Areas	08	-	1	-	1	-	-	07
		140 hrs	20	14	14	10	02	02	150

II PUC BASIC MATHEMATICS (CODE -75) MODEL QUESTION PAPER – 1
(FOR THE YEAR 2022-23)

Time: 3.15 hours   Subject: Basic Mathematics   Marks: 100

General Instructions:

(1) The question paper has 5 parts A, B, C, D and E
(2) Part A carries 20 marks; Part B carries 18 marks; Part C carries 27 marks; Part D carries 25 marks and Part E carries 10 marks
(3) Write the question number properly as indicated in the question paper
(4) Section A should be answered continuously at one or two pages of answer sheet and Only the first answer is considered for marks in Part A.

PART – A

I.   Answer ALL the twenty questions   1x20=20

1. If $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ then the matrix $2A$ will be

a) $\begin{bmatrix} 2 & -4 \\ 6 & 8 \end{bmatrix}$ b) $\begin{bmatrix} 2 & 6 \\ -4 & 8 \end{bmatrix}$ c) $\begin{bmatrix} 8 & -4 \\ 2 & 6 \end{bmatrix}$ d) $\begin{bmatrix} 8 & 2 \\ -6 & 8 \end{bmatrix}$

2. The value of $\begin{vmatrix} 2011 & 2012 \\ 2013 & 2014 \end{vmatrix}$ is

a) 4   b) 0   c) -2   d) 2

3. How many 6 digit numbers can be formed with the digits 2, 7, 6, 1, 9, 8?

a) 24   b) $^6P_4$ c) 720   d) 6

4. If $(A) = \frac{3}{5}$, what is $P(A')$?

a) $\frac{5}{3}$ b) $\frac{2}{5}$ c) $\frac{8}{5}$ d) $\frac{5}{8}$

5. Negation of the proposition $\sim p \vee q$ is

a) $\sim p \vee \sim q$ b) $p \wedge \sim q$ c) $p \vee q$ d) $\sim p \wedge \sim q$

6. The mean proportional to the ratio 2 and 8 is

a) 5   b) -4 c) 16   d) 4

7. The value of $\sin 15°$ is

a) $\frac{1-\sqrt{3}}{2}$ b) $\frac{\sqrt{3}-1}{\sqrt{2}}$ c) $\frac{\sqrt{3}-1}{2\sqrt{2}}$ d) $\frac{1-\sqrt{3}}{\sqrt{2}}$

8. The equation of a circle centered at (0,0) and radius 4 unit is

a) $x^2 - y^2 = 4$ b) $x^2 + y^2 = 4$ c) $x^2 + y^2 = 16$ d) $x^2 - y^2 = 16$

9. If $y = x^e + e^x - e^e$, then $\frac{dy}{dx}$ is

a) e^x b) $ex^{e-1} + e^x$ c) $\frac{x^e}{e+1} - 1$ d) $ex^{e-1} + e^x - e.e^{e-1}$

10. The value of $\int \frac{5}{x} dx$ is

a) $5\log x + c$ b) $-\frac{5}{x^2} + c$ c) $\log x + c$ d) $\frac{1}{5}\log x + c$

For question numbers 11 to 15 choose the appropriate answer from the answers given below
$\left(\frac{-20}{3} , \quad 25 , \quad 12 , \quad 4500 , \quad 72 \right)$

11. If $^nC_{10} = \,^nC_{15}$, then value of n is _____
12. If 5 : 20 = 3 : x, then x is _____
13. The amount of stock at Rs.75 that can be bought for Rs.3375 is _____

14. A shopkeeper purchases an article for Rs.7000 and sells it to a customer at Rs.8200. If VAT is at 6%, then the VAT paid by the shopkeeper is _____

15. The value of $\lim\limits_{x\to 4}\frac{x^2+4}{1-x}$ is _____

16. Symbolize the proposition: If oxygen is a gas then gold is a compound.

17. Define Banker's gain.

18. Define learning index.

19. Find the length of LR for the parabola $x^2 = 32y$.

20. If TC of an article is $C = 5x^2 + 2x + 3$, where x indicates quantity, find its marginal cost function.

PART - B

II. Answer any NINE of the following   2x9=18

21. Find A if $2A + B = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$ and $A - 2B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

22. In how many ways can 5 boys and 5 girls be arranged in a circle if no two girls are together.

23. If $(B) = \frac{1}{2}$, $P(A \cap B) = \frac{1}{4}$, then find $P(A|B)$.

24. If the compound proposition $p \to (q \lor r)$ is false, then find the truth values of p, q and r.

25. What must be added to each term in the ratio $2 : 3$ so that it becomes $5 : 6$?

26. TD on a bill was Rs.100 and BG was Rs.10. what is the face value of the bill ?

27. Prove that $\frac{1 - \cos 2A}{\sin 2A} = \tan A$

28. If $\tan A = \frac{3}{4}$ and $\tan B = \frac{1}{7}$ show that $A + B = \frac{\pi}{4}$

29. Find the equation of the parabola given that its focus is $(0, -3)$ and directrix is $y = 3$.

30. If $f(x) = \begin{cases} \frac{x^4 - 256}{x-4} &, x \neq 4 \\ K, & x = 4 \end{cases}$ is continuous at $x = 4$, find K.

31. If $y = x^x$ then find $\frac{dy}{dx}$

32. If S=$4t^3 - 6t^2 + t - 1$ where S is displacement of a particle at time 't'. Find the velocity and the acceleration when t= 2 sec

33. Evaluate : $\int \frac{7x^6 + 7^x \log 7}{x^7 + 7^x} dx$

34. Evaluate : $\int_1^2 x + e^x \, dx$

PART – C

III. Answer any NINE of the following   3x9=27

35. Solve using Cramer's rule $5x + 3y = 11 ;\ x - 2y = -3$

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

37. 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 team be chosen so that there are at least 4 bowlers and at least 2 wicket keepers.

38. A box contains 8 white balls and 9 red balls. Two balls are taken at random from the box. Find the probability that both of them are red if
    a) The two balls are taken together.

b) The balls are taken one after the other without replacement.

c) The balls are taken one after the other with replacement.

39. Two taps can separately fill a tank in 12min and 15min respectively. The tank when full can be emptied by a drain pipe in 20minutes. When the tank was empty all the 3 were opened simultaneously. In what time the tank be filled up.

40. A bill for Rs. 14600 drawn at 3 months after date was discounted on 11-11-2019 for Rs.14320. If the discount rate is 20% p.a. On what date was the bill drawn.

41. 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 Rs.3600, find his total investment.

42. The price of a washing machine inclusive of sales tax is Rs.13,530. If the sales tax is 10%, find the basic price.

43. Find the focus, equation of directrix and length of latus rectum of $y^2 + 4x = 0$.

44. If $x = at^2$ $y = 2at$ find $\frac{dy}{dx}$

45. The volume of a spherical ball is increasing at the rate of $4\pi \ cc/sec$. Find the rate of increase of the radius of the ball when the volume is $288\pi \ cc$.

46. Divide the number 40 into two parts such that their product is maximum

47. Evaluate : $\int x\sec^2 3x \, dx$

48. Evaluate : $\int \frac{3}{(x+1)(x+2)} dx$

PART – D

IV.   Answer any FIVE of the following   5x5=25

49. Solve the linear equations using the matrix method
$$3x + y + 2z = 3$$
$$2x - 3y - z = -3$$
$$x + 2y + z = 4$$

50. Find the coefficient of x^5 in the expansion of $\left(x + \frac{1}{x^2}\right)^{17}$

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

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

53. 4 men or 12 boys can do a piece of work in 5 days by working 8 hours per day. In how many days 2 men and 4 boys can do the same piece of work by working 12 hours a day.

54. 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.

55. Solve the LPP graphically: Maximize $Z = 6x + 8y$
Subject to constraints
$$4x + 2y \leq 20$$
$$2x + 5y \leq 24$$
$$x, y \geq 0$$

56. Prove that $\dfrac{\sin 6A + \sin 2A + 2\sin 4A}{\sin 7A + \sin 3A + 2\sin 5A} = \dfrac{\sin 4A}{\sin 5A}$

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

58. Find the area enclosed betweenthe parabola $x^2 = 4y$ and the lines $x = 4y - 2$.

PART – E

V.   Answer the following   10x1=10

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

OR

If the angle θ is measured in radians, prove that $\lim\limits_{\theta \to 0} \dfrac{\sin \theta}{\theta} = 1$ (6)

60. The angles of elevation of the top of a tower from the base and the top of a building are $60°$ and $45°$ respectively. The building is 20 meters high. Find the height of the tower.   (4)

OR

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