

MODEL PAPER

End Semester Examination Spring- 2025

Program: Diploma (Mining & CSE)

Subject: Basic Mathematics-II

Subject Code: 8DBSC105 & 3DBSC105

Semester: II

Unit - I

Marks: 5

1. In a single throw of dice, find the probability of obtaining 'a total of 8'.
2. Two cards are drawn at random from a well – shuffled pack of 52 cards. What is the probability that both the drawn cards are aces?
3. Two dice are thrown. Find the odds in favour of getting the sum 5.
4. Find mean deviation about the median for the given data 11,3,8,7,5,14,10,2,9
5. Find Median and Mode from the following frequency distribution:

Marks	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90	90 – 100
Number of students	4	6	12	13	6	4	5

6. Find the mean, variance and the standard deviation for the given data 5,9,8,12,6,10,6,8.

Marks – 10

7. Let A and B be the events such that $P(A)=1/3$, $P(B)=1/4$ and $P(A \cap B)=1/5$. Find
(i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cup B)$ (iv) $P(\bar{B}/\bar{A})$
8. A can solve 90% of the problems given in a book, and B can solve 70%. What is the probability that at least one of them will solve a problem selected at random from the book?
9. Find mean deviation about mean of given frequency Distribution

Marks obtained:	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of students:	8	6	12	5	3	7

10. Calculate the mean deviation about the median for given frequency distribution:

Height (in cm) :	95 – 105	105 – 115	115 – 125	125 – 135	135 – 145	145 - 155
No. of boys :	9	13	25	30	13	10.

Marks: 20

11. Evaluate mean, variance and standard deviation for the given frequency distribution

Class	92	93	97	98	102	104	109
Frequency	3	2	3	2	6	3	3

12. Evaluate mean, variance and standard deviation for the given frequency distribution:

Class	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	3	7	12	15	8	3	2

Unit – II

Marks – 5

13. Define modulus and conjugate of complex number.

14. Express $(-1 + 3i)^{-1}$ in standard form.

15. If $z = (5 + i\sqrt{3})$, find $\text{Re}(z)$, $\text{Im}(z)$, conjugate and modulus of z .

16. Find real values of x and y for which $(1 - i)x + (1 + i)y = 1 - 3i$

17. Express $(-1 + i\sqrt{3})$ in polar form.

Marks – 10

18. Separate $\frac{3+i}{2-i}$ into real and imaginary parts and hence find its modulus.

19. Use De Moivre's theorem to find $(1 - i)^5$.

20. If $(x + iy)^3 = u + iv$ then show that $\left(\frac{u}{x} + \frac{v}{y}\right) = 4(x^2 - y^2)$

Marks: 20

21. (i) If Z is a complex number such that $|z|=1$, prove that $\left(\frac{z-1}{z+1}\right)$ where $z \neq -1$, is purely imaginary except when $z=1$.

(ii) Evaluate $\sqrt{-5 + 12i}$

22. (i) Convert the complex number $\frac{-16}{1+i\sqrt{3}}$ to the polar form.

(ii) Prove that $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11}) = 49$

Unit -III

Marks -05

23. Let $A = \begin{bmatrix} -9 & 5 \\ 7 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -4 \\ 2 & 3 \end{bmatrix}$ find $(8A - 2B)$.

24. If $A = \begin{bmatrix} 3 & 4 \\ -2 & 0 \\ 7 & -5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 5 & 6 \\ -1 & 8 \end{bmatrix}$. Verify that $(A + B)^T = A^T + B^T$

25. Let $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ -2 & 1 \end{bmatrix}$ Find AB and BA show that $AB \neq BA$

26. Find matrix X such that $3A + 2B + X = O$, where $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$

27. Define symmetric and skew-symmetric matrix.

28. Find a matrix X , if $X + \begin{bmatrix} 5 & 6 \\ -4 & 7 \end{bmatrix} = \begin{bmatrix} 3 & -6 \\ 7 & -8 \end{bmatrix}$

Marks – 10

29. Express the matrix $\begin{bmatrix} 1 & 3 & 5 \\ -6 & 8 & 3 \\ -4 & 6 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

30. If $f(x) = x^2 + 5x + 1$ and $A = \begin{bmatrix} 4 & 1 \\ -1 & 2 \end{bmatrix}$, find $f(A)$.

31. Find inverse of the matrix $\begin{bmatrix} 3 & 5 \\ 7 & -9 \end{bmatrix}$

32. If $A = \begin{bmatrix} 2 & -1 & 3 \\ -4 & 5 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & -2 \\ 1 & 5 \end{bmatrix}$ then find AB and BA .

Marks – 20

33. Verify that for $A = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & -2 \\ 1 & 0 & 3 \end{bmatrix}$, $A (\text{Adj } A) = |A| I$.

34. If $A = \begin{bmatrix} 1 & 2 & 5 \\ 1 & -1 & -1 \\ 2 & 3 & -1 \end{bmatrix}$ find A^{-1} .

35. If $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}$, find the value of λ so that $A^2 = \lambda A - 2I$. Hence find A^{-1} .

Unit IV

Marks - 5

36. Find the direction cosines of a line that makes equal angle with the co – ordinate axes.

37. If a line makes angle α, β , and γ with the coordinate axes, prove that $\text{Sin}^2\alpha + \text{Sin}^2\beta + \text{Sin}^2\gamma = 2$.

38. Show that the points A(2,0,3), B(3,2,-1) and C(1,-2,-5) are collinear.

39. Find the angle between the lines whose direction ratios are 3, 2, -6 and 1, 2, 2.

Marks – 10

40. Find the equations of a line which passes through the point (-1,3,-2) and perpendicular to each of the lines $\frac{x}{1} = \frac{y}{2} = \frac{z}{3}$ and $\frac{x+2}{-3} = \frac{y-1}{2} = \frac{z+1}{5}$.

41. Find the angle between the lines $\frac{x+1}{1} = \frac{y-4}{1} = \frac{z-5}{2}$ and $\frac{x+3}{3} = \frac{y-2}{5} = \frac{z+5}{4}$.

42. Show that the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and $\frac{x-4}{5} = \frac{y-1}{2} = \frac{z}{1}$ intersect each other. Find their point of intersection.

Marks – 20

43. Find the length and the equation of the line of shortest distance between the lines given by

$$\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1} \text{ and } \frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}.$$

44. Find the image of the point (0,2,3) in the line $\frac{x+3}{5} = \frac{y-1}{2} = \frac{z+4}{3}$.

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Disclaimer: - This is a Model Question Paper. The Question in End term examination will differ from the Model Question Paper. This Model Paper is meant for practice only.