

Website:- <https://www.arjun00.com.np>

Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back Exam-2077, Chaitra

Program: Diploma in Engineering All

Full Marks: 80

Year/Part: I/II (New+Old Course)

Pass Marks: 32

Subject: Engineering Mathematics II

Time: 3 hrs

Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group 'A'

Attempt All questions.

1. a) If \hat{a} and \hat{b} are unit vectors and θ be the angle between them prove that $\frac{1}{2}|\hat{a} - \hat{b}| = \frac{\sin\theta}{2}$. [5]

- b) State De-Moivre's theorem. Use it to find the cube roots of unity. [5]

2. a) Define direction cosine. Find the angle between the lines whose direction cosines are given by l_1, m_1, n_1 and l_2, m_2, n_2 . [5]

- b) Find the projection of the line AB on CD if the coordinates of the points A, B, C, and D are (0, 5, 0), (1, 2, 4), (-1, 3, 0) and (3, 5, 6) respectively. [5]

3. a) Solve by Cramer's rule or inverse matrix method of the equation $x + y - z = 3$, $2y + z = 10$ and $5x - y - 2z = -3$. [5]

- b) Find the local Maxing and local Minima of the function $f(x) = 2x^3 - 3x^2 - 36x$ Also, find the point of inflection. [5]

Group 'B'

4. Find the area of the circle $x^2 + y^2 = 36$ using method of integration. [5]

Cont.....

Website:- <https://www.arjun00.com.np>

5. A class consists of 60 boys and 40 Girls. If two students are chosen at random what is the probability that: [5]

i) both are boys ii) one boy and one girl.

6. Prove that: $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} = (x-y)(y-z)(z-x)$ [5]

7. Show that by using vector method the angle between two diagonals of a cube is $\theta = \cos^{-1}\left(\frac{1}{3}\right)$. [5]

8. If ω be the cube root of unity prove that: [5]

$$(1 - \omega)(1 - \omega^2)(1 - \omega^4)(1 - \omega^8) = 9.$$

9. Maximize and minimize $F = 34x + 6y$ subject to $x + y \leq 6$, $x + y \geq 1$, $1 \leq x \leq 3$. [5]
Website:- <https://www.arjun00.com.np>

10. Find the equation of the plane through the points $(1, 2, 1)$, $(2, 2, 2)$ and $(0, 1, 0)$ [5]

11. Find standard deviation and coefficient of variation (CV) of the data given below. [5]

Class	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	4	6	8	10	4	3

12. Find the regression equation of y on x from the following data: [5]

X	2	4	6	8	10	12
Y	5	6	13	16	13	24

Also estimate the value of Y when $X = 5$.

13. Find the correlation coefficients between x and y of the following data: [5]

X	2	3	6	5	10	15	12	20	11
Y	19	17	17	10	17	15	13	14	12

Good Luck !