



Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back/Special Exam-2080, Mangsir/Poush

Program: Diploma in Engineering All

Full Mark: 80


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

Pass Mark: 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' 

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Attempt All questions.

[3x(5+5)=30]

1. a) By using De-Moivres theorem find the cube root of i .
b) If w be a cube root of unity, prove that:

$$(2 + w + w^2)^3 + (1 + w - w^2)^3 - (1 - 3w + w^2)^4 = 1$$
2. a) Find the area of the triangle whose two sides are determined by the vectors $2\vec{i} + \vec{j} + \vec{k}$ and $3\vec{i} + 4\vec{j} - \vec{k}$.
b) Find the equation of the plane through the points (4, 5, 1), (3, 9, 4) and (-4, 4, 4)
3. a) Solve by using Cramer's rule of Row equivalent matrix:

$$x + 2y - 3z = 9$$

$$2x - y + 2z = -8$$

$$3x - y - 4z = 3$$

- b) Prove that:

$$\begin{vmatrix} b+c & a & b \\ c+a & c & a \\ a+b & b & c \end{vmatrix} = (a+b+c)(a-c)^2$$

Group 'B'

Attempt All questions.

[10x5=50]

4. Sand is pouring from a pipe at the rate of $18 \text{ cm}^3/\text{sec}$. The falling sand forms a cone on the ground in such a way that the height of the cone is one-sixth of the radius of the base. How fast is height of the cone increasing when its height is 3cm?

Cont.....

5. A man who has got 144 metres of fencing material wishes to enclose a rectangular garden. Find the maximum area he can enclose.
6. Find the Area bounded by the curve $y^2 = 16x$ and the line $y = 2x$.

OR

Find the area bounded by the curve $\frac{x^2}{16} + \frac{y^2}{9} = 1$

7. Prove that the line joining the points (1, 2, 3) and (-1, -2, -3) is perpendicular to the line joining the points (-2, 1, 5) and (3, 3, 2).
8. Maximize and minimize $F = 9x + 7y$ subject to $x + 2y \leq 7$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$.
9. A committee of 3 is to be formed from 6 men and 4 women. What is the probability that all three are women?
10. A company that produces 10% of its products are defective among such 6 products find the probability that one is defective
11. Calculate the quartile deviation and its coefficient from the following data:

Class	10-15	15-20	20-25	25-30	30-35	35-40	40-45
Frequency	2	4	6	7	3	1	5

12. Find the regression equation of y on x from the following data
Also find the value of y when $x = 5$

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

13. Show that the vectors: $\vec{i} + \vec{j} + \vec{k}$, $2\vec{i} + 3\vec{j} - \vec{k}$ and $-\vec{i} - 2\vec{j} + 2\vec{k}$ are co-planar.

Good Luck!



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AC



Regular/Back Exam-2080 Mangsir/Poush

Program: Engineering All

Full Marks: 80

Year/Part: I/II (2021)

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.



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Attempt ALL questions.

[7×(2+2)=28]

1. a. If the equation $x^2 + 2(k+2)x + 9k = 0$ has equal roots. Find k .
b. Find the conjugate of the complex number $\frac{3+4i}{3-4i}$.
2. a. If $A = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 \\ -2 & 4 \end{pmatrix}$. Find $(AB)^T$.
b. If w be a cube roots of unity, prove that $(1-w+w^2)(1+w-w^2)=4$.
3. a. Find the equation of the parabola if vertex = (3, 2) and focus = (3, 4).
b. Find the foci of the hyperbola $3x^2 - 4y^2 = 36$.
4. a. Find the direction cosines of a line which are equally inclined to the axes.
b. Find the distance between the parallel planes $3x+2y-6z=1$ and $6x+4y-12z+9=0$.
5. a. If $\vec{a} = 2\vec{i} + 3\vec{j}$ and $\vec{b} = -\vec{i} + \vec{j}$ find the unit vector along $2\vec{a} - 3\vec{b}$.
b. If $|\vec{a} + \vec{b}| = |\vec{a} - \vec{b}|$. Prove that \vec{a} is perpendicular to \vec{b} .
6. a. Find the area of the triangle whose two sides are determined by the vectors:
 $2\vec{i} - \vec{j} + \vec{k}$ and $3\vec{i} + 4\vec{j} - \vec{k}$
b. Two coins are tossed simultaneously. Find the probability of getting at least one head.
7. a. If mean and median of the given data are 3.5 and 4.5. Find mode.

Cont.

- b. If $n = 15$, $\sigma_x = 3.2$, $\sigma_y = 3.4$ and $\sum(x - \bar{x})(y - \bar{y}) = 122$.
Find the correlation coefficient between the two variables.

Group 'B'

Attempt ALL questions.

[13×4=52]

8. Prove that quadratic equation $ax^2+bx+c=0$, $a \neq 0$ cannot have more than two roots.

9. Prove that:

$$\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = (y-z)(z-x)(x-y)(xy+yz+zx)$$

OR

Solve by row equivalent matrix method or Cramer's rule:

$$x+y+z=1$$

$$x+2y+3z=4$$

$$x+3y+7z=13$$

10. Maximize $z=3x+5y$ subject to constraints $3x+2y \leq 18$, $x \leq 4$, $y \leq 6$ and $x, y \geq 0$.

11. Using De-Moivre's theorem. Find the fourth roots of unity.

OR

Define absolute value of a complex number. If z and w be two complex number then $|z+w| \leq |z|+|w|$.

12. Define parabola. Find the equation of the parabola in the standard form $y^2=4ax$.

13. Show that $x^2+4y^2-4x+24y+24=0$ represents the equation of an ellipse. Find center vertices focus and length of axes.

OR

Determine the equation of the hyperbola in the standard position with focus at $(-7, 0)$ and eccentricity $\frac{7}{4}$.

14. Find the equation of the plane through the points $(1, 2, 1)$, $(2, 2, 2)$ and $(0, 1, 0)$.

15. Find the ratio in which the yz plane divides the line joining $(4, 6, 7)$ and $(-1, 2, 5)$. Also find the coordinates of the point in the yz plane.

OR



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Find the angle between two lines whose direction cosines are given by $l+m+n=0$ and $2lm+2ln-mn=0$.

16. Prove by vector method that:

$$\sin(A - B) = \sin A \cdot \cos B - \cos A \cdot \sin B$$

17. Prove that the three vectors $\vec{a} - 2\vec{b} + 3\vec{c}$, $-2\vec{a} + 3\vec{b} - 4\vec{c}$ and $-\vec{b} + 2\vec{c}$ are coplanar.

OR

If ABCDEF is a regular hexagon and O is its center, then show that:

$$\vec{AB} + \vec{AC} + \vec{AD} + \vec{AE} + \vec{AF} = 6\vec{AO}$$

18. Find the coefficient of variation from the following data:

Class	0-10	10-20	20-30	30-40	40-50
Frequency	2	4	6	7	3

19. Calculate Karl Pearson's coefficient of correlation from the following data:

Age of Husband	23	22	24	23	26	27
Age of Wives	20	18	20	21	21	22

20. A class consists of 40 boys and 60 girls. If two students are chosen at random, what will be the probability that (a) both are boys (b) both are girls (c) one boy and one girl?

OR

The incidence of occupation disease in an industry is such that the workmen have a 20% chance of suffering from it. What is the probability that out of six workmen four or more will contract the disease?

Good Luck !



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AC