

Council for Technical Education and Vocational Training

Office of the Controller of Examinations

Sanothimi, Bhaktapur

Regular/Back Exam-2079, Phagun/Chaitra

Program: Engineering All

Full Marks: 80

Year/Part: I/II (2021)

Pass Marks: 32

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

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.

[7×(2+2)=28]

1. a. Form an equation, whose roots are thrice the roots of $3x^2 - 8x - 4 = 0$ Website :- <https://www.arjun00.com.np>
b. If $a + ib = \sqrt{\frac{1+i}{1-i}}$, prove that $a^2 + b^2 = 1$.
2. a. If $A = \begin{pmatrix} 1 & -2 & 3 \\ -1 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 3 \\ 3 & 1 \\ 1 & 2 \end{pmatrix}$, find the matrix of $AB - 3I$ where I is a unit of matrix of order 2×2 .
b. Express the complex number $-\sqrt{3} + i$ in polar form.
3. a. Find equation of tangent and normal at point (4, 6) of the parabola $y^2 = 9x$. Website :- <https://www.arjun00.com.np>
b. Find the center, vertices, eccentricity and length of latus rectum of the ellipse, $25x^2 + 4y^2 = 100$.
4. a. Find the ratio in which zx -plane divides the segment joining (2, 4, 8) and (1, 6, 7).
b. Find angle between two planes:
 $3x + 2y - 6z = 7$ and $2x + 3y + 2z - 5 = 0$.
5. a. If $\vec{a} = (2, -1)$, $\vec{b} = (-2, -3)$, find $2\vec{a} + 3\vec{b}$, its magnitude and unit vector along $2\vec{a} + 3\vec{b}$.
b. If AC and BD are diagonals of a parallelogram ABCD, prove that $\vec{AB} + \vec{DC} = \vec{AC} + \vec{DB}$.
6. a. Find unit vector perpendicular to each vectors:
 $\vec{i} + 3\vec{j} - 4\vec{k}$ and $2\vec{i} + \vec{j} - \vec{k}$
b. Find the first and third quartile from: 2, 5, 7, 10, 20, 16.

Cont.

7. a. Find standard deviation for data: 12, 14, 16, 18, 20
b. If mean and variance of a binomial distribution are 40 and 36, find the value of p, q and n.

Group 'B'

Attempt ALL questions.

[13×4=52]

8. Prove the quadratic equation $ax^2+bx+c=0$ have not more than two roots. Website :- <https://www.arjun00.com.np>
9. Solve by using Cramer's rule or row equivalent matrix method for:
 $3x+5z=14$, $2x+y-3z=3$ and $x+y+z=4$
10. Using De-Moivre's theorem. Find the square roots of $2 + 2\sqrt{3}i$.
11. Find extreme values of $G(x, y) = 10x+15y$ subject to:
 $x+2y \leq 20$, $x+y \leq 16$ and $x, y \geq 0$
12. Prove that the line $lx+my+n=0$ will touch the parabola $y^2=4ax$ if $ln=am^2$. Website :- <https://www.arjun00.com.np>
13. Establish the standard equation of parabola.
14. Prove by vector method that: $\cos(A-B)=\cos A \cos B + \sin A \sin B$
15. Find the equation of plane through the point (2, -3, 1) and perpendicular to line joining the points (3, 4, -1) and (2, -1, 5).
16. Prove that the vectors: Website :- <https://www.arjun00.com.np>
 $5\vec{a} + 6\vec{b} + 7\vec{c}$, $7\vec{a} - 8\vec{b} + 9\vec{c}$ and $3\vec{a} + 20\vec{b} + 5\vec{c}$ are coplanar.
17. If $\vec{a} = 3\vec{i} + 4\vec{j}$ and $\vec{b} = \vec{i} - \vec{j} + \vec{k}$, show that $\vec{a} \times \vec{b}$ represents a vector which is perpendicular to both \vec{a} and \vec{b} .
18. Find 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

19. By using product moment formula, calculate the coefficient of correlation: Website :- <https://www.arjun00.com.np>

Price (Rs.)	25	19	28	26	20	18	24	20	22	18
Sales (Unit)	60	54	66	70	53	?	62	51	65	50

Where average sales is 59 units?

20. A binomial distribution consists of 5 independent trials. If the probabilities of 1 and 2 successes are respectively $\frac{1}{4}$ and $\frac{1}{8}$, find the probability of success and failure in trial. Also, find $P(r=3)$.

Good Luck !