Dinajpur Board-2017

Higher Mathematics 2nd Paper (Creative) Subject Code : 2 6 6

Time — 2 hours 35 minutes Full marks — 50

[N.B. The figures in the right margin indicate full marks.
Answer five questions taking at least two from each group.]

Group A – Algebra and Trigonometry

1. ✪ A and B are two kinds of food containing protein and starch as per the following table:

Food	Protein (per kg)	Starch (per kg)	Price (per kg)
A	4	5	40 taka
B	6	3	50 taka
Daily minimum requirement	16	11	

a. What do you mean by linear programming? 2

b. Formulate a linear program for this problem. 4

c. Solve the linear program by graphically. 4

2. ▶ $mx^2 + nx + l = 0$, $lx^2 + nx + m = 0$.

a. Solve the equation $2x^2 + 5x - 9 = 0$ with the help of factor 2

b. There is a common root of the two equations in the stem, then show that $m + l = \pm n$. 4

c. If two roots of the 1st equation in the stem are α and β then express the roots of the equation $ml(x^2 + 1) - (n^2 - 2ml)x = 0$ as α and β. 4

3. ▶ $P = 4x + 3$ is a binomial expression.

a. Determine the middle term from the expansion of $\left(2x^2 - \frac{3}{x}\right)^{12}$. 2

b. Coefficients of two consecutive term of the expansion of P^{34} are equal, then find the degree of x of these terms. 4

c. Find the coefficient of x^r from the expansion of $P^{-\frac{1}{2}}$, then also determine the 5th term of this expansion. 4

4. ▶ $A = \cos\theta$, $B = \sin\theta$, $C = \cos 2\theta$, $D = \sin 2\theta$.

a. Evaluate: $\tan^{-1} \sin \cos^{-1}\sqrt{\frac{2}{3}}$. 2

b. Solve the equation $A + \sqrt{3}B = \sqrt{2}$. 4

c. Justify the solution if any of the equation

$A + B = C + D$ in the interval $\left[0, \frac{\pi}{2}\right]$. 4

Group B – Geometry, Mechanics and Statistics

5. ▶ $16x^2 + 25y^2 = 400$.

a. Taking the axes of the ellipse as the x and y axes, find the equation of the ellipse passing through the points $(0, 2\sqrt{2})$ and $(-3, 0)$ 2

b. Find out the vertexes, foci, eccentricity, length of its latus rectum. 4

c. Sketching the conic determine the equations of the lateral recta and equation of the directrices. 4

6. ✪

a. To find the resultant and its direction of two forces 100N and 70N act at a point at an angle 62°. 2

b. When P is increased by (R + 3) and Q is increased by (S + 2), the resultant again pass through the point C. Also when Q and (R + 3) replaced by P and Q respectively the resultant passes through C.

Then prove that $R = S + \frac{(Q - R - 3)^2}{P - Q} + 1$. 4

c. In the stem the two equal and opposite forces R along any two parallel lines at a distance x apart in the same plane of P and Q. Then show that the resultant is displaced by a distance $\frac{xR}{P + Q}$. 4

[**N. B.** $R = S + \frac{(Q - R - 3)^2}{P - Q} + 1$ Replace

$R = S + \frac{(Q - R - 3)^2}{P - Q} - 1$]

7. ▶ The sound of splash was heard t seconds after a piece of stone is let fall into a well. The velocity of sound is v and the depth of the well is h. Resistance of air is neglected.

a. From a balloon ascending with a velocity of 6 meter/second a stone is let fall and it reaches the ground in 10 seconds. How high was the balloon when the stone was dropped? 2

b. According to the stem prove that $(2h - gt^2)v^2 + 2hgtv = h^2g$. 4

c. In light of the stem prove that $t = \sqrt{\frac{2h}{g}} + \frac{h}{v}$. 4

8. ✪

Marks	51-60	61-70	71-80	81-90	91-100
Students	10	20	15	10	5

a. What do you mean by Range according to the stem? 2

b. Determine standard Deviation according the grouped data of the stem. 4

c. In light of the stem find out Mean Deviation. 4

Higher Mathematics 2nd Paper (MCQ)

Subject Code : | 2 | 6 | 6 |

Time — 25 minutes

Full marks — 25

[N.B. Choose the best answer among the options. Fill the circle in the answer sheet with ball point pen. Each question has value 1.]

1. What is the value of $\frac{1}{\omega^{2015}}+\frac{1}{\omega^{2016}}+\frac{1}{\omega^{2017}}$?

a. $-2\omega^2$ b. -2ω c. 0 d. 3

Answer the questions no. 2 and 3 according to the following stem:

If constraints: $3x + 4y \geq 12$, $4x + 7y \leq 28$, $x - 2y \geq 2$ and $z = 4x + y$ in linear programming, then

2. Which feasible region satisfies the first two inequalities?

a. Hexagon b. Pentagon
c. Quadrilateral d. Triangle

3. What is the maximum value of z under the feasible region satisfies the second and third inequalities?

a. 35 b. 28 c. 20 d. 8

4. If α and β are the roots of the equation $13x^2 - 6x - 7 = 0$, then what is the form of the equation whose roots are $\alpha^{-1} + 1$ and $\beta^{-1} + 1$?

a. $7x^2 - 8x - 12 = 0$ b. $7x^2 - 20x = 0$
c. $7x^2 + 8x - 12 = 0$ d. $7x^2 + 8x = 0$

5. ★ What are the coordinates of the focus of the conic $3y^2 - 30y + 5x + 55 = 0$?

a. $\left(-\frac{53}{12}, 5\right)$ b. $\left(-\frac{43}{12}, 5\right)$
c. $\left(\frac{43}{12}, 5\right)$ d. $\left(\frac{53}{12}, 5\right)$

6. If $\sin 2\theta + 3\sin\theta = 0$, What is the value of θ?

a. $(2n + 1)\pi$ b. $(4n + 1)\frac{\pi}{2}$
c. $(2n + 1)\frac{\pi}{2}$ d. $n\pi$

7. ★ If the coefficient of the 6-th and 7-th terms are equal in the expansion of $\left(\frac{a}{x} + x\right)^{13}$, then what is the value of a?

a. $\frac{4}{3}$ b. 1 c. ± 1 d. $\frac{3}{4}$

8. In the ellipse $\frac{(x-3)^2}{3} + \frac{(y+1)^2}{4} = 1$

i. Coordinate of a vertex is (3, 1)
ii. Length of minor axis 6
iii. One equation of the latus rectum is $y + 2 = 0$

Which one of the following is correct?

a. i and ii b. ii and iii
c. i and iii d. i, ii and iii

9. If $\frac{1}{2} - \sqrt{3}i$ is a root of the equation $4x^3 + 12x^2 - 3x + 52 = 0$, then what is the real root of it?

a. -5 b. -4 c. 4 d. 5

10. In straight line a particle starting with a given velocity moves for 20 seconds with uniform acceleration 3 ms^{-2} attained the average velocity 50ms^{-1}.

What is the initial velocity of the particle?

a. 40 ms^{-1} b. 35 ms^{-1} c. 20 ms^{-1} d. 10 ms^{-1}

Answer the questions no. 11 and 12 according to the following stem:

If the mean and covariance of two numbers are 7 and 4 respectively, then

11. ★ What is the coefficient of variation?

a. $\frac{200}{7}\%$ b. $\frac{4}{7}$ c. $\frac{200}{7}$ d. $\frac{400}{7}\%$

12. ★ What is the value of two data?

a. 9, 5 b. 8, 6 c. 11, 3 d. 7, 7

13. Two unlike parallel forces of magnitude 42N and 24N acting on a rigid body at the points A and B respectively. If their resultant acts at the point C on BA externally, what is the ratio of AC and BC?

a. 7 : 6 b. 7 : 4 c. 6 : 7 d. 4 : 7

14. What is the solution of $(2x - 5)^2 \leq 0$?

a. $x = 2.5$ b. $x \leq 2.5$
c. $x \geq 2.5$ d. $0 \leq x \leq 2.5$

15. What is the distance between two directrices of a hyperbola $y^2 - 2(x + 3)^2 = 18$?

a. $4\sqrt{3}$ b. $4\sqrt{2}$ c. $3\sqrt{2}$ d. $2\sqrt{3}$

16. Two equal forces of magnitude $(2 + 2\sqrt{2})$N acting at a point have a resultant force of magnitude $(4 + 4\sqrt{2})$N. What is the angle between the forces?

a. 0° b. 45° c. 90° d. 180°

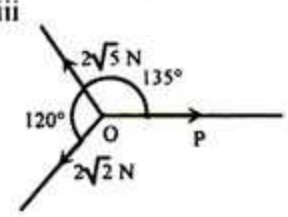
17. In inequality $-2 \leq x \leq 3$ —

i. Which contains 6 integer numbers
ii. upper bound is 15
iii. absolute value sign $|2x - 1| \leq 5$

Which one of the following is correct?

a. i and ii b. ii and iii
c. i and iii d. i, ii and iii

18. If the three forces showed in the above figure are in equilibrium, what is the value of the force P?



a. $4\sqrt{3}$N b. 2N
c. $2\sqrt{3}$N d. $\sqrt{3}$N

19. If $z = -1 + i\sqrt{3}$, then —

i. $z^9 = 64$
ii. the argument of z is 120°
iii. the square root of z are $\pm\frac{1}{\sqrt{2}}(1 - i\sqrt{3})$

Which one of the following is correct?

a. i b. ii
c. ii and iii d. i, ii and iii

20. A swimmer wishing to go directly across a river of width 2.45 kms. He swims at right angle to the current of a river and with a velocity equal to $\frac{7}{3}$ times the velocity of the current. Where he meets the opposite bank below the starting point?

a. 0.32 km b. 1.05 km c. 1.50 km d. 5.72 km

21. What is the coefficient of x^{12} in the expansion of $\left(2x - \frac{1}{x^2}\right)^{15}$?

a. -30 b. -24
c. 24 d. 30

[* right answer: -15×2^{14}]

Answer the questions no. 22 and 23 according to the following stem:

In equation $y = \sin^{-1}\frac{\sqrt{3}}{2} + \cos^{-1}x$.

22. If $y = 90°$, what is the value of x?

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

23. If $x = \frac{3\sqrt{3}}{\sqrt{31}}$, what is the value of y?

a. $\tan^{-1}\frac{5\sqrt{3}}{-7}$ b. $\tan^{-1}\frac{11}{\sqrt{3}}$
c. $\tan^{-1}\frac{-\sqrt{3}}{11}$ d. $\tan^{-1}\frac{7}{5\sqrt{3}}$

24. ★ A box contains 4 white, 3 black and 5 green marbles. Three marbles are drawn at random. The probability of the marbles to be—

i. 3 green is $\frac{1}{22}$ ii. 3 different colour is $\frac{3}{11}$
iii. at best 2 white is $\frac{9}{11}$

Which one of the following is correct?

a. i and ii b. ii and iii
c. i and iii d. i, ii and iii

25. A stone is dropped into an empty well and the sound of its striking the bottom is heard after 4sec. If 330 ms^{-1} be the velocity of sound, what is the depth of the well?

a. 75.5 m b. 76.5 m
c. 78.4 m d. 79.4 m

[* right answer: 70.01m]

Ans.	1	ⓒ	2	ⓒ	3	ⓑ	4	ⓐ	5	ⓒ	6	ⓓ	7	ⓐ	8	ⓒ	9	ⓑ	10	ⓒ	11	ⓐ	12	ⓐ	13	ⓓ
	14	ⓐ	15	ⓐ	16	ⓐ	17	ⓓ	18	ⓒ	19	ⓑ	20	ⓑ	21	*	22	ⓒ	23	ⓑ	24	ⓐ	25	*		