

Chattogram Board 2016

Higher Mathematics

Subject Code :

1	2	6
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Times — 2 hours 10 minutes

Full marks — 40

[Read the stems carefully and answer the associated questions. Taking minimum one question from each group answer altogether four questions.]

Group A—Algebra

1. ► $p(x) = x^3 + x^2 - 6x$ and $f(x) = x^2 - 9x - 6$ are two functions.
- a. Find the remainder by using remainder theorem when $f(x)$ is divided by $(x + 3)$. 2
- b. If $p(x)$ yields the same remainder upon division by $(x - a)$ and $(x - b)$ where $a \neq b$, then show that $a^2 + ab + b^2 + a + b = 6$. 4
- c. Express $\frac{f(x)}{p(x)}$ into partial fractions. 4
2. ► If the n -th term of a series is— $U_n = (1 + x)^{n-2}$
- a. Determine the series. 2
- b. Find the condition which should be imposed on x , so that the given series will have a sum upto infinity and find the sum. 4
- c. Find the 8th term of the series. If the value of the middle term in the expansion of the given term is 540, then find the value of x . 4

Group B—Geometry and Vector

3. ► The vertices of $\triangle ABC$ are $A(2, -4)$, $B(-4, 4)$ and $C(3, a)$ respectively. Where $a > 0$.

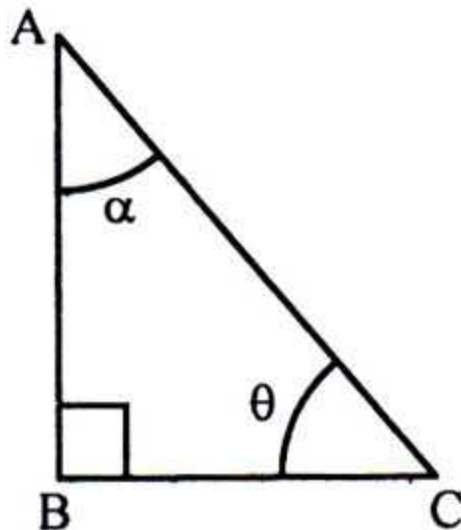
- If $AC = BC$, find the value of a . 2
- Determine the equation of straight line AB and its slope. 4
- With the help of vectors, prove that the line segment joining the middle points of any two sides of a triangle is parallel to and half of the third side. 4

4. ► AC and BD are two diagonals of a cyclic quadrilateral $ABCD$ of circle with radius 3 cm.

- Determine circumference of the circle. 2
- Prove that, $AC \cdot BD = AB \cdot CD + BC \cdot AD$. 4
- Construct a triangle whose base is the diameter of the circle and the difference of other two sides is the radius of the circle and vertical angle is 30° . [The sign of construction and description are essential] 4

Group C—Trigonometry and Probability

5. ►

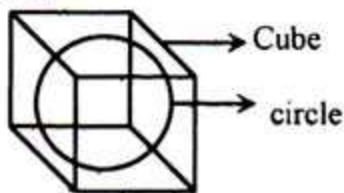


- a. Find the quadrant, in which -700° situated with figure. 2
- b. If $\left(\frac{AC}{BC}\right)^2 + \left(\frac{AB}{BC}\right)^2 = \frac{5}{3}$, then find the value of θ . 4
- c. According to the stem, show that $\sin 2\alpha = 2\sin\alpha \cos\alpha =$
 $\frac{2\tan\alpha}{1 + \tan^2\alpha}$. 4

6.► The probability that a person will travel from Chittagong to Dhaka by bus is $\frac{2}{5}$, the probability of that person will travel from Dhaka to Rajshahi by train is $\frac{5}{8}$ and that he will travel from Rajshahi to Khulna by plane is $\frac{3}{10}$.

- a. What are the certain events and impossible events? 2
- b. Draw the probability tree. 4
- c. Find the probability that the person will travel from Chittagong not by bus, from Dhaka to Rajshahi by train and from Rajshahi to Khulna by plane. Also find the probability that the person will travel from Dhaka to Rajshahi by train and then travel to Khulna not by plane. 4

Answer to the questions No. 20 and 21 from the above figure:



Diameter of the sphere = edge of the cube 6 cm.

20. What is the volume of the sphere?
 (a) 12π (b) 36π (c) 72π (d) 288π
21. What is volume of unoccupied portion of the cube in cubic cm?
 (a) 194.79 (b) 152.38
 (c) 102.90 (d) 39.40
22. Which one is the limit of probability?
 (a) $0 < p < 1$ (b) $0 \leq p \leq 1$
 (c) $0 < p \leq 1$ (d) $0 \leq p < 1$

Answer to the questions no. 23 and 24 from the above information:

In a bag there are 4 red, 5 black and 3 yellow balls. A ball is taken at random—

23. What is the probability of the ball to be green?
 (a) 0 (b) $\frac{1}{3}$ (c) $\frac{1}{4}$ (d) $\frac{5}{12}$
24. What is the percentage of probability of the ball to be black?
 (a) 41.7% (b) 33.33%
 (c) 25% (d) 20%
25. U is universal and the subsets of A, B and C which one of the following De Morgan's Law?
 (a) $(A \cup B)' = A' \cap B'$
 (b) $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$
 (c) $A \cup B = B \cup A$
 (d) $A \cap B' = B \setminus A$
26. Which one of the following image set of $F(x) = x^2 - 2x$; for the domain $X = \{-1, 0, 1\}$?
 (a) $\{-1, 0\}$
 (b) $\{3, 0, -1\}$
 (c) $\{-1, 0, 3\}$
 (d) $\{-1, 0, 1\}$

27. For the function $F(x) = \frac{x}{x-2}$

- i. define $f(x)$ at $x = 2$
 ii. its one-one function

iii. $F^{-1}(x) = \frac{2x}{x-1}$

Which one of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

28. i. The largest of the degrees of the terms appearing in a polynomial is called the degree of the polynomial
 ii. The terms of a polynomial of the variable x, y, z have the form $cx^p y^q z^r$

iii. Multiplication of two polynomial is always polynomial

Which one of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

29. Which one is improper fractions?

- (a) $\frac{x+5}{(x-1)(x+2)}$
 (b) $\frac{x-1}{(x-2)(x+5)}$
 (c) $\frac{x^3}{(x-1)(x-2)(x-3)}$
 (d) $\frac{x^3}{x^4 + x^2 - 1}$

30. If $Q(x) = x^3 + 2x^2 + 2x + 1$ and $Q(-1) = 0$ then which one of the factors of $Q(x)$?

- (a) $x - 1$
 (b) $x + 1$
 (c) $x^2 + x - 1$
 (d) $x^2 - x + 1$

31. In $\triangle ABC$ —

- i. $\angle C > 90^\circ$ then $AB^2 > AC^2 + BC^2$
 ii. $\angle C = 90^\circ$ then $AB^2 = AC^2 + BC^2$
 iii. $\angle C < 90^\circ$ then $AB^2 < AC^2 + BC^2$

Which one of the following is correct?

- (a) i & ii (b) i & iii
 (c) ii & iii (d) i, ii & iii

32.



Which two triangles are equiangular?

- (a) $\triangle ABP$ and $\triangle ADP$
 (b) $\triangle AOG$ and $\triangle SPG$
 (c) $\triangle ADC$ and $\triangle AOG$
 (d) $\triangle ADP$ and $\triangle ADC$

33. What is the point of concurrence of the medians of a triangle?

- (a) Centroid
 (b) Circumcentre
 (c) Nine point
 (d) Incentre

34. What is the length tangent of a point at a distance of 5cm from the centre of radius 2 cm?

- (a) 3 cm (b) 4.6 cm
 (c) 21 cm (d) 29 cm

35. i. A triangle cannot be drawn with any lengths of three sides
 ii. A circle can be drawn only the radius
 iii. At an any point on a circle only one tangent can be drawn

Which one of the following is correct?

- (a) i & ii
 (b) i & iii
 (c) ii & iii
 (d) i, ii & iii

1	(a)	2	(c)	3	(c)	4	(d)	5	(d)	6	(c)	7	(d)	8	(d)	9	(a)	10	(c)	11	(b)	12	(b)	13	(c)	14	(c)	15	(d)	16	(d)	17	(a)	18	(d)	19	(b)	20	(b)	21	(c)	22	(b)	23	(a)	24	(a)	25	(a)	26	(b)	27	(c)	28	(a)	29	(c)	30	(b)	31	(d)	32	(b)	33	(a)	34	(b)	35	(a)
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