

Model Question of SSC Examination 2021 for All Board

Higher Mathematics

Subject Code :

1	2	6
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Time — 2 hours 30 minutes

Full Marks — 50

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

Group A – Algebra

1. ★ $f(x) = 18x^3 + 15x^2 - x + a$, $g(x) = x^3 + x^2 - 6x$ and

$$p = \frac{bc(a+d)}{(a-b)(a-c)} + \frac{ca(b+d)}{(b-c)(b-a)} + \frac{ab(c+d)}{(c-a)(c-b)}$$
 are three

algebraic expressions.

- a. Resolve into factors of $g(x)$. 2
- b. Find the value of 'a' if $(3x + 2)$ is a factor of the polynomial $f(x)$. 4
- c. Simplify p . 4

2. ★ $a^x = b^y = c^z$, where $a \neq b \neq c$, $M = \frac{p^2 + pq}{pq - q^3} - \frac{\sqrt{p}}{\sqrt{p-q}}$.

- a. If $ab = c^2$ then, prove that, $\frac{1}{x} + \frac{1}{y} = \frac{2}{z}$. 2
- b. If $abc = 1$ then, prove that, $\frac{1}{x^3} + \frac{1}{y^3} + \frac{1}{z^3} = \frac{3}{xyz}$. 4
- c. Show that, $M = \frac{\sqrt{p}}{q}$. 4

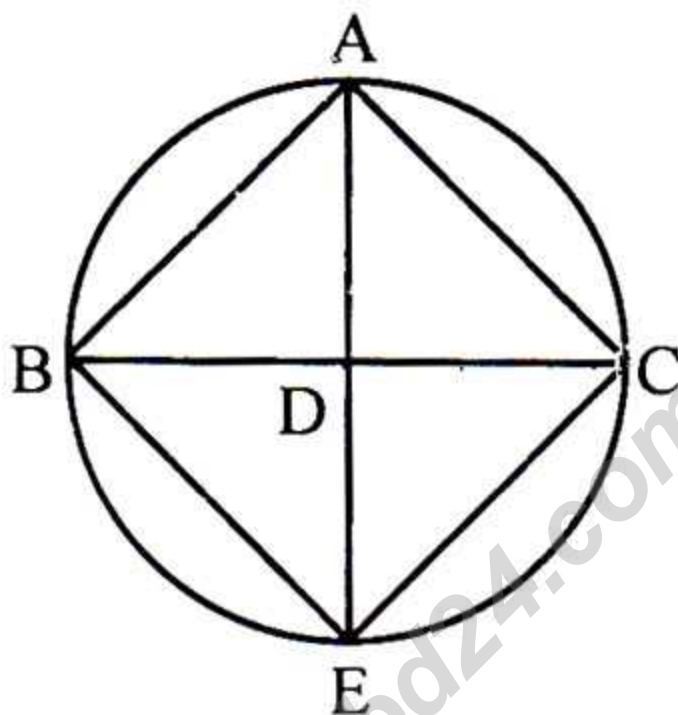
3. ▶ $A = \left(1 - \frac{x}{3}\right)^4$, $B = (p + qx)^6$, $C = (q - px)^7$

- a. Solve : $a(x + b) < r$, [$a \neq 0$] 2
- b. If $P = 1$, $q = 2$, then find the co-efficient of x^6 in the expansion of BC . 4

- c. Expanding $A \left(1 + \frac{x}{3}\right)^4$ upto x^5 in ascending power of x and by using the result find the value of $1.01 \times (0.9999)^5$. 4

Group B – Geometry and Vector

4. ►



- a. If the length of the side of an equilateral triangle is 4cm, then determine the area of the inner-circle. 2
- b. Prove that, $AE \cdot BC = AB \cdot CE + BE \cdot AC$. 4
- c. If AE is the bisector of $\angle A$, then prove that, $AD^2 = AB \cdot AC - BD \cdot CD$ 4
5. ► The points A (7,2), B (-4,2), C (-4, -3) and D (7, -3) are respectively the four vertices of a quadrilateral.
- a. Find the equation of the straight line AC. 2
- b. Ascertain whether the quadrilateral is a parallelogram or a rectangle also find the area of the quadrilateral by using method II. 4
- c. If the middle points of the quadrilateral mentioned in the stem are respectively P, Q, R and S then prove by using

vector method PQRS is a parallelogram. 4

6. ► The hypotenuse and sum of other two sides of a right angled triangle are 5cm and 7cm respectively.

a. Find the area of the triangle. 2

b. Construct the triangle. [Description and sign of construction are necessary.] 4

c. Find the volume and area of curve surface of the solid formed by greater side other than hypotenuses. 4

Group C - Trigonometry & Probability

7. ★ $(x^2 + 3) \sin^2\theta + (x^2 - 1) \cos^2\theta = x + 2$

a. If $\theta = \frac{\pi}{2}$, find the value of x. 2

b. If $x = 2$, prove that, $\tan\theta = \pm \frac{1}{\sqrt{3}}$ 4

c. If $x = 0$ and $0 < \theta < 2\pi$, find the possible value of x. 4

8. ► The probability that Hasan will travel from Dhaka to Cumilla by bus is $\frac{3}{5}$ and that he will travel from Cumilla to

Chattogram by train is $\frac{5}{7}$ and Rakib through of two dice.

a. Define Random experiment with example. 2

b. Draw a probability tree and write down the sample space by throw dice Rakib. 4

c. Use a to determine the probability that Hasan will Dhaka to Cumilla by bus and will subsequently travel to Chittagong not by Train. (Use to probability tree) 4

Time — 25 minutes

[N.B — Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

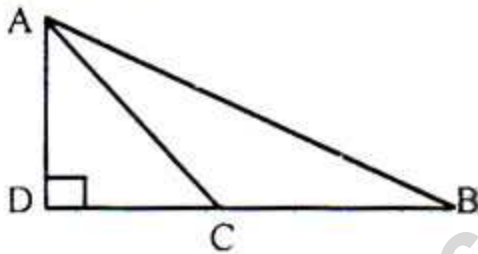
1. Any finite set for A, then $(A/(A/A)) = ?$

(a) A	(b) A'
(c) U	(d) \emptyset
2. If $f(x) = x^3 + 3$, then what is the value of $f^{-1}(3)$?

(a) 0	(b) 3
(c) 27	(d) 30
3. If $\frac{x-5}{(x+1)(x-2)} = \frac{A}{x+1} + \frac{B}{x-2}$, where A and B are rational number, then which is the value of A?

(a) -3	(b) -2
(c) 1	(d) 2

In the light of the given figure, answer the questions no 4 and 5:



4. Which is the orthogonal projection of AC on DB?

(a) AD	(b) DC
(c) DB	(d) CB
5. $\angle B$ is an acute angle, then what is the value of AC^2 ?

(a) $AB^2 + BC^2 - 2BC \cdot BD$	
(b) $AB^2 + BC^2 - 2BC \cdot CD$	
(c) $AB^2 + BC^2 + 2AC \cdot CD$	
(d) $AB^2 + BC^2 + 2AB \cdot AD$	
6. If the roots of the equation $bx^2 + ax + c = 0$ are real, unequal and rational, then—
 - i. $a^2 - 4bc > 0$ and is not a perfect square
 - ii. $a^2 - 4bc > 0$ and is a perfect square.
 - iii. $a^2 - 4bc = 0$

Which one is correct?

- | | |
|------------|-----------------|
| (a) i | (b) ii |
| (c) i & ii | (d) i, ii & iii |
7. If $a^x = b$, $b^y = c$ and $c^z = a$, then $xyz =$ what?

(a) -1	(b) 0
(c) 1	(d) 2
 8. \underline{a} , \underline{b} , \underline{c} are the position vectors of A, B, C respectively. If C divides AB internally in the ratio 5: 11, the $\underline{c} = ?$

(a) $\frac{5b+11a}{16}$	(b) $\frac{11b+5a}{16}$
(c) $\frac{5b-11a}{16}$	(d) $\frac{11b-5a}{16}$

Answer the question no. 9 and 10 from the following information—

In a bag there are 4 red, 6 white and 8 black balls. A ball is chosen at random.

9. What is the probability that the ball will be black?

(a) $\frac{2}{9}$	(b) $\frac{1}{3}$	(c) $\frac{5}{9}$	(d) $\frac{4}{9}$
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10. What is the probability that the ball will not be red?

(a) $\frac{1}{3}$	(b) $\frac{2}{9}$	(c) $\frac{7}{9}$	(d) $\frac{4}{9}$
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11. If $\cos\theta = \frac{1}{\sqrt{2}}$ then

i. $\sec^2\theta = 2$		
ii. $\sin^2\theta = \frac{1}{2}$	iii. $\tan^2\theta = 1$	

Which one is correct?

(a) i & ii	(b) i & iii
(c) ii & iii	(d) i, ii & iii
12. Which angle is made by the line $\sqrt{3}x+y-5=0$ with x-axis?

(a) 30°	(b) 60°
(c) 120°	(d) 150°

Answer the question no. 13 and 14 according to the given information :

A metallic solid sphere of diameter 6 cm. is melted and a right circular cylinder the radius of whose base is 3 cm. is made.

13. What is the height of the cylinder made?

- (a) 4 cm (b) 6 cm
(c) 8 cm (d) 12 cm

14. What is the area of the curved surface of the cylinder in square centimeters?

- (a) 12π (b) 24π (c) 36π (d) 42π

15. What is the 17th term of a sequence whose nth term is $\frac{1-(-1)^n}{2}$?

- (a) -1 (b) 0 (c) 1 (d) 2

16. \star What will be the remainder if the polynomial $p(x) = 2x^2 - 9x + 6$ is divided by $(x-4)$?

- (a) 4 (b) 2
(c) 1 (d) -2

17. The length of an edge of a regular tetrahedron is 2cm. and height $\frac{2}{\sqrt{3}}$ cm.

What is the volume of the tetrahedron?

- (a) $\frac{1}{2}$ cubic cm. (b) $\frac{2}{3}$ cubic cm.
(c) 1 cubic cm. (d) 2 cubic cm.

18. A spherical ball of diameter 4 cm. exactly fits in a cylindrical box. What is the volume of the cylindrical box?

- (a) $2\pi\text{cm}^3$ (b) $4\pi\text{cm}^3$
(c) $8\pi\text{cm}^3$ (d) $16\pi\text{cm}^3$

19. \star If $a, b, x > 0$ and $a \neq 1, b \neq 1$ then

i. $\log_{\sqrt{a}} a \times \log_{\sqrt{b}} b = 4$

ii. $\log \frac{ab}{x} = \log a + \log b - \log x$

iii. $a^x = \sqrt[3]{a^2}$, when $x = \frac{2}{3}$

Which one is correct?

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

20. What is the domain of the function

$$f(x) = \frac{1}{3x-2}$$

- (a) $\{x : x \in \mathbb{R} \text{ and } x \geq 0\}$
(b) $\{x : x \in \mathbb{R} \text{ and } x \leq 0\}$
(c) $\{x : x \in \mathbb{R} \text{ and } x \neq \frac{2}{3}\}$
(d) $\{x : x \in \mathbb{R} \text{ and } x \neq -\frac{2}{3}\}$

21. If the point $(a, 0), (0, b)$ and $(1,1)$ are collinear, then which one is correct?

- (a) $a + b = 1$ (b) $a + b = -1$
(c) $a + b = -ab$ (d) $a + b = ab$

22. \star If $\cos\theta + \sin\theta = \sqrt{2}$; what is the value of θ ?

- (a) 30° (b) 45° (c) 60° (d) 90°

23. In the triangle ABC, $\operatorname{cosec} \frac{A+C}{2} = ?$

- (a) $\sec \frac{\pi}{2}$ (b) $\operatorname{cosec} \frac{\pi}{2}$
(c) $\sec \frac{B}{2}$ (d) $\operatorname{cosec} \frac{B}{2}$

24. The angles of a triangle are in arithmetical progression and the smallest angle is half of the largest angle. What is the value of largest angle in circular system.

- (a) $\frac{4\pi}{9}$ (b) $\frac{\pi}{3}$ (c) $\frac{\pi}{2}$ (d) $\frac{\pi}{9}$

25. \star Which is the associative law of addition of vectors?

- (a) $\underline{u} + \underline{v} = \underline{v} + \underline{u}$
(b) $(\underline{u} + \underline{v}) + \underline{w} = \underline{u} + (\underline{v} + \underline{w})$
(c) $m(\underline{u} + \underline{v}) = m\underline{u} + m\underline{v}$
(d) $(-\underline{u}) + \underline{u} = 0$

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