

# Model Question of SSC Examination 2020 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. ▶  $f(x) = \frac{x-2}{x-3}$  where  $x \neq 3$  and  $g(x) = \frac{x-3}{2x+1}$  where  $x \neq -\frac{1}{2}$ .

- a. Explain the range of  $p(x) = 2x - 3$  2  
b. Justify  $f(x)$  is onto function or not. 4  
c. Find the value of  $g^{-1}(5)$ . 4

2. ▶  $\frac{2y}{y-1} = q$  and  $y \neq 0, y \neq 1$

- a. If  $q = \frac{8}{y}$ , find the value of  $y$ . 2

b. If  $\left\{ \frac{2(q+y)}{q} \right\}^{\frac{1}{3}} + \left( -\frac{2y}{q} \right)^{\frac{1}{3}} = 2^{\frac{1}{3}}$ , find the value of  $y$ . 4

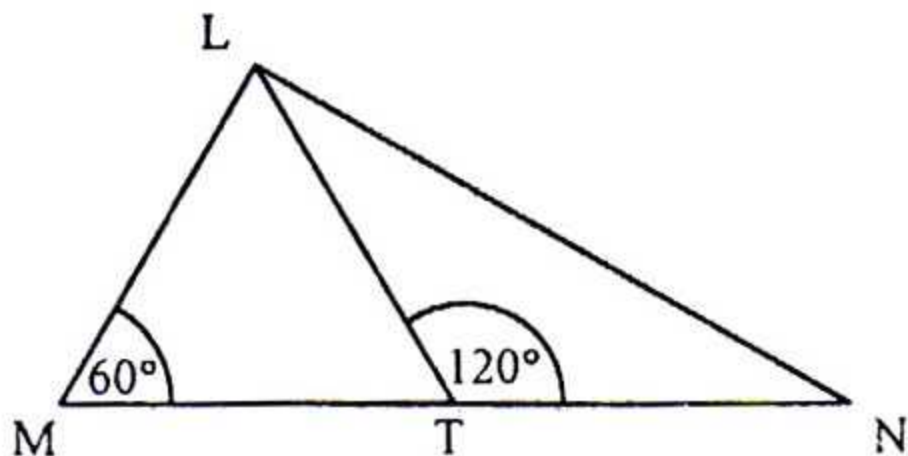
c. If  $6\sqrt{q} + 5\sqrt{\frac{1}{q}} = 13$ , what is the value of  $(y+4)$ ? 4

3. ★  $(A+Bx)^n$  is an algebraic expression.

- a. If  $A = 1, B = 2$  and  $n = 5$ , find the expression using Pascal's triangle. 2  
b. If  $B = 3, n = 7$  then the coefficient of  $x^4$  in the expansion of the expression is 22680. Find the value of  $A$ . 4  
c. If  $A = 2, B = 1$ , then the coefficient of the 5<sup>th</sup> and 6<sup>th</sup> term is equal. Find the value of  $n$ . 4

## Group B – Geometry and Vector

4. ★



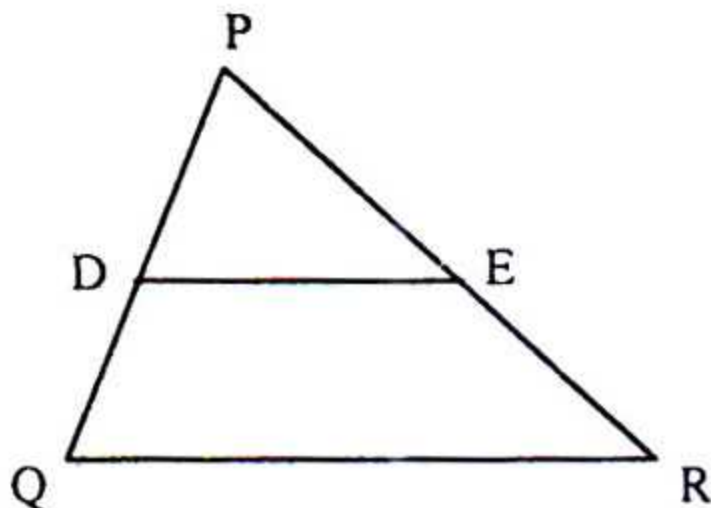
- a. In the figure, explain whether the orthocenter and the centroid of the triangle  $MLT$  are same or not. 2
- b. If  $T$  is the middle point of the side  $MN$ , prove that  $ML^2 + LN^2 = 2(LT^2 + MT^2)$  4
- c. If a line segment  $PQ$  is drawn parallel to  $MT$  which intersects  $ML$  and  $LT$  at  $P$  and  $Q$  respectively, prove that  $MQ^2 - TQ^2 = MT \cdot PQ$  4

5. ►  $y = x + 4$  ..... (i),  $y = x - 4$  ..... (ii)  $y = -x + 4$  ..... (iii) and  $y = -x - 4$  ..... (iv) are four linear equations.

- a. What is the angle between  $x$ -axis and the line (iii) 2
- b. Find the area of the triangle formed by the line (i) with axis of the coordinates. 4
- c. If the equations are the sides of quadrilateral, then find the equations of the diagonals. 4

6. ► i. In  $\Delta PQR$ ,  $D$  and  $E$  are the middle point of  $PQ$  and  $PR$  respectively.

ii. Three spherical glass of radii 9, 12 and 5 cm are melted and formed into a single cone with radius of the base 6 cm.



- a. In vector method, explain the relation between DE and QR. 2
- b. If L and M are the middle points of DQ and ER respectively then by the vector method, prove that  $DE \parallel LM \parallel QR = \frac{1}{2} (DE + QR)$  4
- c. Find the area of whole surface of the cone. 4

### Group C - Trigonometry & Probability

7. ►  $f(z) = \cos z$  and  $g(A) = \sin A$ .
- a. If  $15\{g(A)\}^2 + 2f(A) = 7$ , find the value of A, where A is an acute angle. 2
- b. If  $f(x) + g(x) = \sqrt{2}f(x)$ , prove that,  $f(x) - g(x) = \sqrt{2}g(x)$ . 4
- c. If  $72\{f(\theta)\}^5 - 8\{f(\theta)\}^3 + 9\{g(\theta)\}^2 = 8$ , find the possible value of  $\theta$ . 4
8. ★ A bag contains 6 white, 7 red and 9 black balls. One ball is drawn at random from the bag.
- a. What is the probability of getting the ball to be black? 2
- b. What is the probability of getting the ball to be white or red? 4
- c. What is the probability of getting the ball to be white but not red? 4

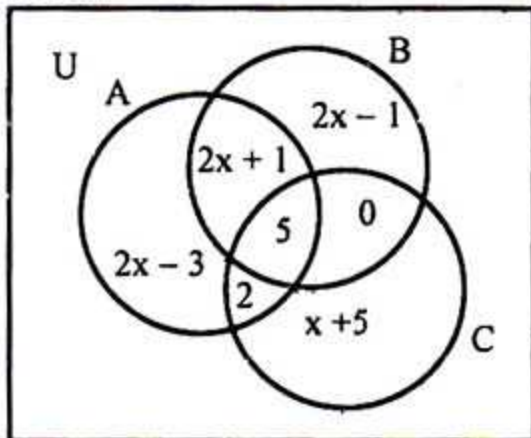
[N.B— Answer all the questions. Each question carries one mark. Block fully, with a ball-point pen, the circle of the letter that stands for the correct/best answer in the "Answer Sheet" for Multiple Choice Questions Examination.]

1. If  $f(x) = \sqrt{3-x}$ , what is the domain of  $f$ ?  
 (a)  $\{x \in \mathbb{R} : x < 3\}$     (b)  $\{x \in \mathbb{R} : x \leq 3\}$   
 (c)  $\{x \in \mathbb{R} : x \geq 3\}$     (d)  $\{x \in \mathbb{R} : x > 3\}$
2.  If  $\cos 2\theta = 0$ , What is the value of  $\frac{2\tan\theta}{1 + \tan^2\theta}$ ?  
 (a)  $-1$     (b)  $0$   
 (c)  $\frac{1}{2}$     (d)  $1$
3. Find the value of  $\sin^2 10^\circ + \sin^2 20^\circ + \dots + \sin^2 80^\circ + \sin^2 90^\circ$ .  
 (a)  $6$     (b)  $5$   
 (c)  $4$     (d)  $3$
4.   $A = \{1, 2, 3\}$  and  $B = \{4, 5, 6\}$  then—  
 i.  $A \cup B = \{x : x \in \mathbb{N} \text{ and } x \leq 6\}$   
 ii.  $A \cap B = \emptyset$   
 iii.  $A \cup B = \{1, 2, 3, 4, 5, 6\}$   
 Which one is correct?  
 (a) i & ii    (b) ii & iii  
 (c) i & iii    (d) i, ii & iii
5. If  $P(x) = x^4 - 5x^3 + 7x^2 - a$  and  $(x-2)$  is a factor of  $P(x)$ , the value of  $a$  is—  
 (a)  $6$     (b)  $4$   
 (c)  $-3$     (d)  $-4$
6. In the expansion of  $(1 - 6x)^6$  the coefficient of  $x$  is—  
 (a)  $-6$     (b)  $-18$   
 (c)  $18$     (d)  $-36$
7. Which one is not a one-one function?  
 (a)  $f(x) = 5x + 4$     (b)  $f(x) = \frac{5}{x+3}$   
 (c)  $f(x) = \sqrt{2x-3}$     (d)  $f(x) = (2x+1)^2$
8. What is the domain of  $f(x) = \frac{x}{|x|}$ ?  
 (a)  $(0, 1)$     (b)  $\{-1, 1\}$   
 (c)  $\mathbb{R}$     (d)  $\mathbb{R} - \{0\}$
9. What is the number of proper subset of  $A = \{1, 2, 3, 4\}$ ?  
 (a)  $2^4$     (b)  $2^4 + 1$   
 (c)  $2^4 - 1$     (d)  $4^2 + 1$
10.  If  $\cos\theta + \sin\theta = \sqrt{2}$  then—  
 i.  $\theta = \frac{\pi}{4}$     ii.  $\theta = \frac{5\pi}{4}$     iii.  $\theta = \frac{9\pi}{4}$   
 Which one is correct?  
 (a) i & ii    (b) ii & iii  
 (c) i & iii    (d) i, ii & iii
11. If  $f(x) = \frac{2x+3}{2x-1}$  and  $x \neq \frac{1}{2}$ , what is the value of  $f^{-1}(3)$ ?  
 (a)  $\frac{2}{3}$     (b)  $3$   
 (c)  $2$     (d)  $\frac{3}{2}$
12.  $(x-y)^6$  is a binomial expansion. If  $y = \frac{1}{x}$ , what is the value of constant term?  
 (a)  $-20$     (b)  $1$   
 (c)  $4$     (d)  $12$
13.  What is the sum of  $1^{\text{st}}$   $(2n+1)$  terms of the series  $2 - 2 + 2 - 2 + 2 - \dots$ ?  
 (a)  $-2$     (b)  $0$   
 (c)  $1$     (d)  $2$

14. What is the graph of the function  $f(x) = 2x + 4$ ?

- (a) Circle (b) Curve line  
(c) Straight line (d) Ellipse

The elements of the sets A, B, C have been given in the Venn diagram,  $U = A \cup B \cup C$   
answer 15-17



15. ★ If  $n(U) = 58$ , find the value of  $x$ .

- (a) 2 (b) 7  
(c) 8 (d) 9

16. ★ Find the value of  $n(B \cap C')$ .

- (a) 14 (b) 19  
(c) 28 (d) 33

17. ★ Find the value of  $n(A \cap B \cap C')$

- (a) 7 (b) 10  
(c) 13 (d) 15

18. If the points  $(x, y)$ ,  $(2, 3)$  and  $(5, 1)$  are collinear then —

- (a)  $4x - 3y - 17 = 0$   
(b)  $2x + 3y - 13 = 0$   
(c)  $3x + 4y + 17 = 0$   
(d)  $3x - 4y + 5 = 0$

19. If  $x^2 = 9x + 8y$  and  $y^2 = 8x + 9y$ , what is the value of  $2x + 2y$ ?

- (a) 0 (b) 1  
(c) 2 (d) 3

20. If  $P(x) = 32x^4 - 16x^2 + 8x + 7$ , what is the value of  $P(1)$ ?

- (a) 1 (b) 31  
(c) 47 (d) 63

21. If  $\overrightarrow{AB} = \overrightarrow{CD}$ , then—

- i.  $AB = CD$   
ii.  $AB$  is parallel to  $CD$   
iii.  $ABCD$  is a parallelogram

Which one is correct?

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

22. The area of a triangle with vertices

$(-1, -2)$ ,  $(2, 5)$  and  $(3, 10)$  is—

- (a) 4 sq units (b) 10 sq. units  
(c) 15 sq units (d) 18 sq units

23. In which quadrant does the angle  $A$  lie,

where  $\sin A = \frac{1}{\sqrt{2}}$  and  $\tan A = -1$ ?

- (a) First (b) Second  
(c) Third (d) Fourth

24. A coin is thrown three times. What is the number of sample point of probability?

- (a) 2 (b) 4  
(c) 6 (d) 8

25. ★ If  $27.81^x = 9^{x+2}$ , what is the value of  $x$ ?

- (a) 0 (b)  $\frac{1}{2}$   
(c) 1 (d)  $\frac{7}{2}$

Ans.

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