Model Question of SSC Examination 2020 for All Board

Higher Mathematics Subject Code : 1 2 6

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. ✪ Let $f: \mathbb{R} \to \mathbb{R}$ then function is defined as $f(x) = \frac{4x+3}{2x+5}$.

a. Determine whether the relation $x^2 + y^2 = 25$ is function or not? 2

b. Find whether the function f is one-one or not. 4

c. If $f^{-1}(-6) = m.f^{-1}(-2)$, find the value of m. 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 sum up to infinity under certain condition of x for which the infinite series exist. 4

c. If the value of the middle term in the expansion of the given term for $n = 8$ is 1280, then find the value of x. 4

3. ▶ A logarithmic function is defined as $f(x) = \log_e x$.

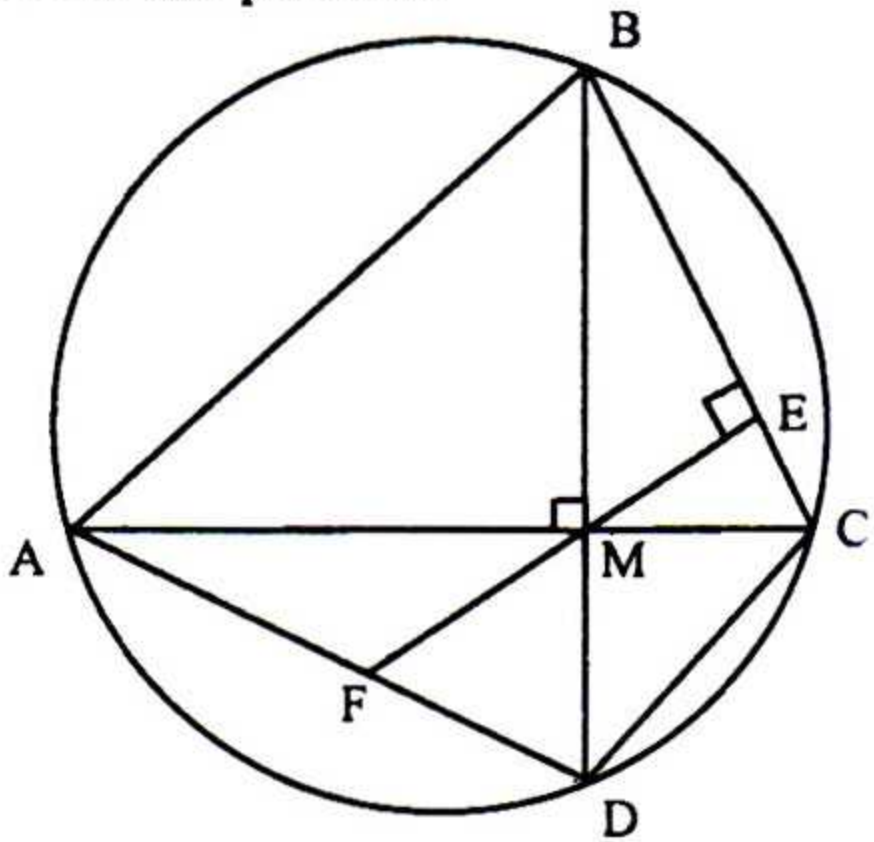
a. Find the conditions for which the function $y = \ln\frac{5+x}{5-x}$ becomes undefined. 2

b. Draw the graph of the function. 4

c. Determine the inverse function of $f(x)$. 4

Group B – Geometry and Vector

4. ★ The diagonal AC and BD of the quadrilateral ABCD inscribed in a circle intersect at the point M. ME is the perpendicular on BC from M and extended EM intersects the opposite side AD at the point F.



a. Draw a circle which passes through two definite points and whose centre lies on a definite straight line. 2

b. Prove that AF = FD. 4

c. Consider the triangle ABC whose circumcentre is S and middle point of AC is R. If a perpendicular AP is drawn from A to BC which intersects BM at the other center O. Determine the relation between BO and SR. 4

5. ★ Given, $3x + 4y = 12$.

a. Determine the intersecting point of $y = x - 4$ and $y = x + 4$. 2

b. If P(x, y) is the equidistant from the intersecting point of the straight line with the axes, then prove that $8x - 6y = 7$. 4

c. Find the total surface area of the solid formed, if the perpendicular height is 8 unit whose triangular base is produced by the line with the two axes. 4

6. ▶ D, E and F are the middle points of the sides BC, CA and AB of the triangle ABC respectively.

a. If both a, b are non-zero and non-parallel vectors and if $ma + nb = 0$, then show that $m = n = 0$. 2

b. Prove that $\overrightarrow{AD} + \overrightarrow{BE} + \overrightarrow{CF} = 0$ 4

c. Prove with the help of vectors that the straight line drawn through F parallel to BC must go through E. 4

Group C - Trigonometry & Probability

7. ▶ Consider $f(x) = \sin x$.

a. Prove that "Radian is a constant angle". 2

b. Find the value of $f(\alpha) = -\frac{\sqrt{3}}{2}; \frac{\pi}{2} < \alpha < \frac{3\pi}{2}$. 4

c. Solve $\left\{f\left(\frac{\pi}{2} + x\right)\right\}^2 + f(x) = \frac{5}{4}$ where $0 < x < 2\pi$. 4

8. ✪ A coin and a dice are thrown together.

a. Write down the sample space for above stem. 2

b. Determine the probability of getting head and odd number. 4

c. Find the probability of getting at least one head and one even numbers together. 4

Creative Multiple Choice Questions Subject Code : 1 2 6

Time — 25 minutes **Higher Mathematics** Full Marks — 25

[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 A and B are two disjoint sets, then A – B = ?

ⓐ A ⓑ B

ⓒ U ⓓ φ

2. Which one is the domain of $f(x) = \frac{x}{|x|}$?

ⓐ {0} ⓑ $\mathbb{R} - \{0\}$

ⓒ {–1, 1} ⓓ $\mathbb{R}$

3. If $\sqrt{8x+9} - \sqrt{2x+15} = \sqrt{2x-6}$, then x = ?

ⓐ – 5 ⓑ 0

ⓒ 5 ⓓ 6

4. ★ What is the degree of zero polynomial?

ⓐ 0 ⓑ 1

ⓒ any number ⓓ undefined

5. Which one is not a one-one fucntion?

ⓐ $f(x) = 2x + 3$ ⓑ $f(x) = |x|$

ⓒ $f(x) = \log x$ ⓓ $f(x) = e^{-x}$

6. Equation of the y-axis is—

ⓐ $x = 0$ ⓑ $y = 0$

ⓒ $x + y = 0$ ⓓ $x - y = 0$

7. ★ If S = {(1, – 1), (2, – 2), (3, – 2)}, then

i. Relation S is a function

ii. S is a one one function

iii. Range of S is {– 1, – 2}

Which of the following is correct?

ⓐ i

ⓑ iii

ⓒ i & iii

ⓓ i, ii & iii

8. If $3^{2x-2} - 5.3^{ax-2} - 66 = 0$ what is the value of a if x = 3?

ⓐ – 2 ⓑ – 1

ⓒ 0 ⓓ 1

9. $\frac{5x-7}{(x-1)(x-2)} \equiv \frac{A}{x-1} + \frac{B}{x-2}$, where A & B are rational numbers. What is the value of A?

ⓐ – 3 ⓑ – 2

ⓒ 1 ⓓ 2

10. The co-ordinate of the point on which the axis intersects is —

ⓐ (0, 0) ⓑ (1, 0)

ⓒ (0, 1) ⓓ (1, 1)

Answer the questions 11-12 according to the following stem :

Two unbiased coins are tossed twice at the same time

11. ★ What is the probability of not getting any head?

ⓐ $\frac{3}{4}$ ⓑ $\frac{1}{4}$

ⓒ $\frac{3}{8}$ ⓓ $\frac{1}{8}$

12. ★ What is the probability of getting at least one head?

ⓐ $\frac{3}{4}$ ⓑ $\frac{1}{2}$

ⓒ $\frac{1}{4}$ ⓓ $\frac{3}{8}$

13. Which one of the following is the equation of a straight line passing through the point (3, – 4) and parallel to the y-axis?

ⓐ $x = -4$ ⓑ $y = -4$

ⓒ $x = 3$ ⓓ $y = 3$

14. What is the radius of the giant wheel which makes 80 revolutions to cover a distance of 1.25 km?

ⓐ 1.24 ⓑ 2.48

ⓒ 4.97 ⓓ 7.81

15. **Which one is the solution set of the inequality $x \leq \frac{x}{5} + 8$?**

ⓐ $S = \{x \in R : x \leq -10\}$
ⓑ $S = \{x \in R : x \geq -10\}$
ⓒ $S = \{x \in R : x \leq 10\}$
ⓓ $S = \{x \in R : x \geq 10\}$

16. **If 1st term is 2 and common ratio is –1, which one is the 5^{th} term of the geometric series?**

ⓐ -4 ⓑ -2
ⓒ 2 ⓓ 4

17. **Where does the centre of the circum-circle of a right angled triangle lie on?**

ⓐ On opposite
ⓑ On base
ⓒ On hypotenuse
ⓓ Outside of triangle

18. **What is the value of $AB^2 + AC^2$ if in triangle ABC, median AD = 7cm and side BD = 9cm**

ⓐ 16cm
ⓑ 32cm
ⓒ 256cm
ⓓ 260cm

19. **What is the ratio of two angles adjoining the hypotenuse isosceles right angled triangle.**

ⓐ 1 : 1 ⓑ 1 : 2
ⓒ 2 : 1 ⓓ 2 : 3

20. **The function $f(x) = \ln(x - 5)$ is —**

i. Exponential function
ii. Defined for $x > 5$
iii. Range $\mathbb{R}_f = (0, \infty)$

Which of the following is correct?

ⓐ i & ii
ⓑ i & iii
ⓒ ii & iii
ⓓ i, ii & iii

21. **If a and b are repectively the position vectors of A and B with respect to the origin O then which one is correct?**

ⓐ $AB = b - a$
ⓑ $AB = a - b$
ⓒ $OB = b - a$
ⓓ $OA = a - b$

22. **In the equation $ax^2 + bx + c = 0$, if discriminant $b^2 - 4ac > 0$ and is not a perfect square then two roots are—**

ⓐ Real, unequal & irrational
ⓑ Imagnary
ⓒ Real, unequal & rational
ⓓ Real & equal

Answer the questions 23-24 according to the following stem :

The diameter of a cone is 8m and slant surface makes an angle 60° with horizon.

23. **How much space in square meters will be required to build the tent?**

ⓐ 144.52 ⓑ 82.26
ⓒ 50.27 ⓓ 25.135

24. **Which one is the amount of the gap inside the tent?**

ⓐ 116.08 ⓑ 201.1
ⓒ 536.171 ⓓ 672.33

25. **In the expansion of $(1 + px)^8$, for which value of p the co-efficient of x^3 and x^4 are equal?**

ⓐ $\frac{3}{5}$ ⓑ $\frac{3}{4}$
ⓒ $\frac{4}{5}$ ⓓ $\frac{5}{4}$

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	ⓒ										