Model Question of SSC Examination-2016 (All Board)

Time — 2 hours

Higher Mathematics

Creative

Total marks — 40

Subject code: | 1 | 2 | 6 |

[Taking at least one from each group answer any four questions. Each question carries 10 marks.]

Group-A: Algebra

1. ▶ $A = \{x : x \in R \text{ and } x^2 - (a + b)x + ab = 0$, $B = \{1, 2\}$ and $C = \{2, 4, 5\}$

a. Find the elements of the set A. 2

b. Show that $P(B \cap C) = P(B) \cap (P(C)$. 4

c. Prove that, $A \times (B \cup C) = (A \times B) \cup (A \times C)$. 4

2. ▶ $a^2 + 2 = 3^{\frac{2}{3}} + 3^{\frac{-2}{3}}$, $x^2 + y^2 = 7xy$.

a. Define cyclic function with an example. 2

b. Prove that, $a^3 + 9a = 8$. 4

c. Prove that, $\log(x + y) - \log 3 = \frac{1}{2}\log x + \frac{1}{2}\log y$. 4

Group-B: Geometry and Vector

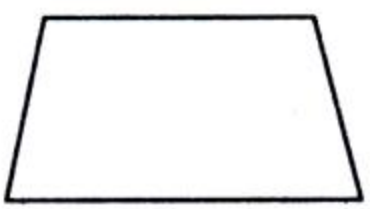
3. ▶ A(2, –4),B(–4, 4) and C(3, 3) are the three vertices of a triangle.

a. Plot the points on graph paper and draw the triangle. 2

b. Find the equation of the line AB and AC. 4

c. If $3x + 2y = 6$ is a straight line equation. Determine the magnitude of the intersected part of the two axes and find the area of the triangle produced by the line with the two axes. 4

4. ▶



a. Define Nine Point Circle. 2

b. Prove that the circumcenter, the centroid and the orthocenter of any triangle are collinear. 4

c. Prove by vector method that the straight lines joining the middle points of the adjacent sides of a quadrilateral form of a parallelogram. 4

Group-C: Trigonometry and Probability

5. ▶ Radius of the earth is 6440 km, distance of two places on the surface of the earth which subtend an angle of 32″ at the centre of the earth?

a. Express 32″ in radians. 2

b. Find the distance of two places. 4

c. In ΔABC, $\angle ABC = 90°$, $\angle ACB = \theta$, $AB = \sqrt{3}$, $BC = 1$ and if $\sec\theta + \cos\theta = P$ then find the value of P and solve the equation. 4

6. ▶ A bag contains 6 black, 5 red and 8 white marbles. A marble is drawn at random from the bag.

a. Find the probability that the marble is red. 2

b. i. Find the probability that the marble is black. ii. Find the probability that the marble is white or red. 4

c. If the probability that a person will travel from Dhaka to Khulna by bus is 2/5 and that he will travel from Khulna to Rajshahi by trian is 5/8. Use a probability tree to determine the probability that the person will travel from Dhaka to Khulna by bus and will subsequently travel to Rajshahi not by train. 4

Answers

1. (a) a and b
3. (b) $4x + 3y + 4 = 0$ and $7x - y - 18 = 0$
   (c) $\sqrt{13}$ unit and 3 sq unit
5. (a) 0.000155 radian (b) 1 km (approx) (c) $\frac{5}{2}$ and $\theta = \frac{\pi}{3}$
6. (a) $\frac{5}{19}$ (b) (i) $\frac{6}{19}$; (ii) $\frac{13}{19}$ (c) $\frac{3}{20}$

Multiple Choice Questions

Time — 35 Minute Full Marks— 35 Subject Code : | 1 | 2 | 6 |

[Find out the best/correct answer and fill the circles with ballpoint pen. Each question is worth 1 mark.]

1. What is the value of (A\(A\A))?
ⓐ A ⓑ ∅
ⓒ A′ ⓓ 0

$P(x) = 3x^3 + 2x^2 - 7x + 8$? With P(x) answer question (2 – 4)

2. The leading co-efficient of P (x) is
ⓐ 3x ⓑ 3
ⓒ x ⓓ 2

3. 8 is known as...
ⓐ Variable ⓑ Constant
ⓒ function ⓓ relation

4. What is the value of P (–1)?
ⓐ 8 ⓑ 13
ⓒ 14 ⓓ 20

$ax^2 + bx + c = 0$ is a quadratic equation with this information answer questions (5 – 7)

5. If $b^2 - 4ac < 0$ then the roots of the equation will be....
ⓐ Real ⓑ Imaginary
ⓒ Perfect square ⓓ Zero

6. $b^2 - 4ac$ is known as
ⓐ Discriminant ⓑ Roots
ⓒ coefficient ⓓ factor

7. What is the value of b in the equation $x^2 - x - 12 = 0$? With compare of quadratic equation
ⓐ 0 ⓑ 1
ⓒ –1 ⓓ 3

8. If $8^{x+7} = 4^{x+2}$, what is the value of x?
ⓐ 8 ⓑ 12
ⓒ 21 ⓓ –17

9. 1 + 0.1 + 0.01 + 0.001 .... what is the sum (if it exists) of the given infinite geometric series.
ⓐ 10 ⓑ 9
ⓒ 8 ⓓ 10/9

10. How many way the sets is expressed?
ⓐ 2 ⓑ 3
ⓒ 4 ⓓ 5

11. If x – 2 is a factor of the polynomial $x^4 - 5x^3 + 7x^2 - a$, what is the value of a?
ⓐ 1 ⓑ 2
ⓒ 3 ⓓ 4

12. i. The centre of the nine point circle is the middle point of the line segment joining the orthocenter and the circumcentre
ii. The radius of the nine point circle is half of the circumardius.
iii. If R is the circumradius of the triangle ABC and AD ⊥ BC; then AB.AC = 2R.AD.

With above information which one is correct?
ⓐ i ⓑ i and ii
ⓒ i and iii ⓓ i, ii and iii

13. The nth term of a sequence is $U_n = 1/n$, if $U_n < 10^{-5}$, What will be the value of n?
ⓐ $n > 10^5$ ⓑ $n = 10^5$

Answer to the questions 14 and 15 to the information given below.
A spherical ball of diameter 2 cm exactly fits in the cylindrical box.

14. What is the volume of the cylinder in cc.?
ⓐ 2π ⓑ 4π
ⓒ 6π ⓓ 8π

15. What is the volume unoccupied portion of the cylinder in cc.?
ⓐ $\pi/3$ ⓑ $2\pi/3$
ⓒ $4\pi/3$ ⓓ $8\pi/3$

Answer to the questions 16 and 17 to the information given below
A ball is drawn at random from a bag containing 12 blue, 16 white and 20 red balls.

16. What is the probability that the ball is blue?
ⓐ 1/16 ⓑ 1/12
ⓒ 1/8 ⓓ 1/4

17. What is the probability that the ball is white?
ⓐ 1/3 ⓑ 2/3
ⓒ 1/16 ⓓ 1/48

18. Lengths of other two sides except the hypotenuse of a right-angled triangle are 4 cm. and 3 cm. If the triangle is revolved about the larger side, the revolved solid will be a

i. right circular cone

ii. right circular cylinder

iii. the area of the base of the evolved solid is 9π square centimetres

With above information which one is correct?

ⓐ i ⓑ i and ii

ⓒ i and iii ⓓ i, ii and iii

19. $f(x) = \frac{x}{x-2}$, what is the value of $f^{-1}(2)$?

ⓐ 2 ⓑ 4

ⓒ 6 ⓓ 8

20. If $\cos\varphi = 4/5$ then what is the value of $\tan\varphi$?

ⓐ 3/5 ⓑ 2

ⓒ 4/3 ⓓ 3/4

21. The circumference of any circle of radius 2r is equal to

ⓐ π ⓑ π

ⓒ $2\pi r$ ⓓ $4\pi r$

22. Which one is exponential function?

ⓐ $y = x$ ⓑ $y = mx$

ⓒ $y = a + 3x$ ⓓ $y = e^x$

23. $x^2 + y^2 + 2gx + 2fy + c = 0$, equation is

ⓐ Ellipse ⓑ Parabola

ⓒ Hyparabola ⓓ Circle

24. Given A = {–2, –1, 0, 1, 2} and S = {(x, y) : x ∈ A, y ∈ A and $y = x^2$} which of the following is a member of S?

ⓐ (2, 4) ⓑ (–2, 4)

ⓒ (–1,1) ⓓ (1, –1)

25. Number of element of null set is

ⓐ 3 ⓑ 2

ⓒ 1 ⓓ 0

Answer question 26–27 from this information :

C is any point on the line segment AB and a, b & c are respectively the position vectors of the points A, B & C with respect to a vetor origin.

26. Which one of the following is correct when the point C divides AB internally in the ratio 2 : 3?

ⓐ a + 2b/5 ⓑ 2a + b/5

ⓒ (2b + 3a)/5 ⓓ (3b + 2b)/5

27. Which one of the following is correct if O is the vector origin?

ⓐ OA = a – b ⓑ OA + OC = AC

ⓒ AB = b – a ⓓ OC = c – b

A coin is tossed thrice. Answer uestions 28 – 29

28. What is the probability of getting head most of times?

ⓐ $\frac{1}{8}$ ⓑ $\frac{1}{2}$

ⓒ $\frac{3}{8}$ ⓓ $\frac{1}{4}$

29. What is the probability of getting T the least number of times?

ⓐ 0 ⓑ 1/2

ⓒ 1/8 ⓓ 2

30. Suppose an unbiased dice is thrown, Probaility of getting number 3 on the faces is

ⓐ 1/3 ⓑ 1/6

ⓒ 3/6 ⓓ 1

31. Distance between the points (1,2) and (2, 2) is

ⓐ 0 ⓑ 1

ⓒ 2 ⓓ 3

32. If a right circular cone has a height of 12 cm. and base diameter is 10 cm. The slant height is

ⓐ 6/5 ⓑ 2

ⓒ 13 ⓓ 17

33. Slope of the straight line passing through (2, 3) and (3, 6) is

ⓐ 1/3 ⓑ 2

ⓒ 3 ⓓ 4

34. The product of two slopes of the two lines $x - 2y - 10 = 0$ and $2x + y - 3 = 0$ is

ⓐ –2 ⓑ 2

ⓒ 1 ⓓ –1

35. The coefficients of x^3 in the expansion of $(1 + 3x)^5$ is –

ⓐ 90 ⓑ 270

ⓒ 405 ⓓ 243

Answers																																								
	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	ⓓ	26	ⓒ	27	ⓒ	28	ⓐ	29	ⓒ	30	ⓑ	31	ⓐ	32	ⓒ	33	ⓒ	34	ⓓ	35	ⓑ										