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SSLC MODEL EXAMINATION

MATHEMATICS
[English Version]

Time allowed: 2½ Hours] **[Maximum Marks: 100**

Instructions: (1) Check the question paper for fairness printing. If there is any lack of fairness, inform the Hall Supervisor immediately.
(2) Use Black or Blue ink to write and pencil to draw diagrams.
Note: This question paper contains four sections.

SECTION – I
(Marks 15)

Note: (i) Answer all the 15 questions.
(ii) Choose the correct answer from the given four alternatives and write the option code and the corresponding answer. **15 x 1 =15**

1. If A = {p, q, r, s} , B = {r, s, t, u}, then A \ B is
(1) {p, q} (2) {t, u} (3) {r, s} (4) {p, q, r, s}

2. If the sequence $a_1, a_2, a_3, \ldots\ldots$ is in A.P, then the sequence $a_5, a_{10}, a_{15}, \ldots\ldots$ is
(1) a G.P (2) an A.P (3) neither A.P nor G.P (4) a constant sequence

3. In a G.P, $t_2 = \frac{3}{5}$ and $t_3 = \frac{1}{5}$. Then the common ratio is
(1) $\frac{1}{5}$ (2) $\frac{1}{3}$ (3) 1 (4) 5

4. The GCD of $(x^3 + 1)$ and $(x^4 - 1)$ is
(1) $x^3 - 1$ (2) $x^3 - 1$ (3) $x + 1$ (4) $x - 1$

5. If $x^2 + 5kx + 16 = 0$ has no real roots, then
(1) $k > \frac{8}{5}$ (2) $k > -\frac{8}{5}$ (3) $-\frac{8}{5} < k < \frac{8}{5}$ (4) $0 < k < \frac{8}{5}$

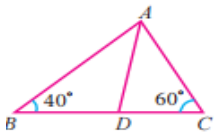
6. $\begin{pmatrix} -1 & 0 \\ 0 & 1 \end{pmatrix}\begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$ then the values of a, b, c and d respectively are
(1) –1, 0, 0, –1 (2) 1, 0, 0, 1 (3) –1, 0, 1, 0 (4) 1, 0, 0, 0

7. If (1, 2), (4, 6), (x, 6) and (3, 2) are the vertices of a parallelogram taken in order, then the value of x is
(1) 6 (2) 2 (3) 1 (4) 3

8. If the points $(2,5), (4,6)$ and (a, a) are collinear, then the value of a is equal to

(1) –8 (2) 4 (3) –4 (4) 8

9. In the figure, if $\frac{AB}{AC} = \frac{BD}{DC}$, $\angle B = 40°$ and $\angle C = 60°$, then $\angle BAD =$



(1) 30° (2) 50° (3) 80° (4) 40°

10. A point P is 26 cm away from the centre O of a circle and PT is the tangent drawn from P to the circle is 10 cm, then OT is equal to

(1) 36 cm (2) 20 cm (3) 18 cm (4) 24 cm

11. $\frac{\sec\theta}{\cot\theta + \tan\theta} =$

(1) $\cot\theta$ (2) $\tan\theta$ (3) $\sin\theta$ (4) $-\cot\theta$

12. $(\cos^2\theta - 1)(\cot^2\theta + 1) + 1 =$

(1) 1 (2) –1 (3) 2 (4) 0

13. The total surface area of a solid hemisphere of diameter 2 cm is equal to

(1) 12 cm^2 (2) 12π cm^2 (3) 4π cm^2 (4) 3π cm^2

14. If the variance of 14, 18, 22, 26, 30 is 32, then the variance of 28, 36, 44, 52, 60 is

(1) 64 (2) 128 (3) $32\sqrt{2}$ (4) 32

15. If p is the probability of an event A, then p satisfies

(1) $0 < p < 1$ (2) $0 \le p \le 1$ (3) $0 \le p < 1$ (4) $0 < p \le 1$

SECTION – II
(Marks 20)

Note: (i) Answer 10 questions.
(ii) Question No. 30 is Compulsory. Choose any 9 questions from first 14 questions. 10 x 2 = 20

16. Represent the function $f = \{(-1, 2), (-3, 1), (-5, 6), (-4, 3)\}$ as (i) a table (ii) an arrow diagram

17. Three numbers are in the ratio 2 : 5 : 7. If the first number, the resulting number on the subtraction of 7 from the second number and the third number form an arithmetic sequence, then find the numbers.

18. Find the quadratic polynomial with zeros at $x = \frac{1}{4}$ and x = –1.

19. Form the quadratic equation whose roots are $7 + \sqrt{3}$ and $7 - \sqrt{3}$

20. Construct a 3 x 2 matrix A = $[a_{ij}]$ whose elements are given by $a_{ij} = \frac{(i-2j)^2}{2}$

21. Let A = $\begin{pmatrix} 3 & 2 \\ 5 & 1 \end{pmatrix}$ and B = $\begin{pmatrix} 8 & -1 \\ 4 & 3 \end{pmatrix}$. Find the matrix C if C = 2A + B.

22. Show that the points are $(a, b + c)$, $(b, c + a)$ and $(c, a + b)$ are collinear.

23. ABCD is a quadrilateral such that all of its sides touch a circle. If AB = 6 cm, BC = 6.5 cm and CD = 7 cm, then find the length of AD.

24. Prove that $\sqrt{\sec^2\theta + \cos ec^2\theta} = \tan\theta + \cot\theta$

25. Find the angular elevation (angle of elevation from the ground level) of the Sun when the length of the shadow of a 30 m long pole is $10\sqrt{3}$.

26. Radius and slant height of a cone are 20 cm and 29 cm respectively. Find its volume.

27. A cone, a hemisphere and cylinder have equal bases. If the heights of the cone and the cylinder are equal and are same as the common radius, then find the ratio of their respective volumes.

28. Find the standard deviation of the first 10 natural numbers.

29. Let A, B, C be any three mutually exclusive and exhaustive events such that $P(B) = \frac{3}{2}P(A)$ and $P(C) = \frac{1}{2}P(B)$. Find P(A).

30. (a) For $A = \{x \mid -3 \le x < 4, x \in \mathrm{R}\}$, $B = \{x \mid x < 5, x \in \mathrm{N}\}$ and C = {–5, –3, –1, 0, 1, 3}, find A ∩ (B ∪ C).

(OR)

(b) If the straight lines $\frac{y}{2} = x - p$ and $ax + 5 = 3y$ are parallel, then find a.

SECTION – III
(Marks 45)

Note: (i) Answer 9 questions:
(ii) Question No. 45 is Compulsory. Select any 8 questions from the first 14 questions. 9 x 5 = 45

31. Use Venn diagrams to verify De Morgan's law for set difference $A \setminus (B \cap C) = (A \setminus B) \cup (A \setminus C)$.

32. A function $f : [-3, 7) \to \mathrm{R}$ is defined as follows

$$f(x) = \begin{cases} 4x^2 - 1; & -3 \le x < 2 \\ 3x - 2; & 2 \le x \le 4 \\ 2x - 3; & 4 < x < 7 \end{cases}$$

Find (i) $f(5) + f(6)$ (ii) $f(1) - f(-3)$ (iii) $f(-2) - f(4)$ (iv) $\frac{f(3) + f(-1)}{2f(6) - f(1)}$

33. The sum of the first three terms of a G.P is 13 and sum of their squares is 91. Determine the G.P

34. Find the total volume of 15 cubes whose edges are 16cm, 17cm, 18cm, ..., 30 cm respectively.

35. Solve: $\frac{x}{x+1} + \frac{x+1}{x} = \frac{34}{15}$

36. If $m - nx + 25x^2 - 24x^3 + 16x^4$ is a perfect square then find the values of *m* and *n*.

37. If α and β are the roots of the equation $3x^2 - 5x + 2 = 0$, then find the values of

(i) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ (ii) $\alpha - \beta$ (iii) $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha}$

38. If $A = \begin{pmatrix} 1 & -4 \\ -2 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} -1 & 6 \\ 3 & -2 \end{pmatrix}$ then prove that $(A + B)^2 = A^2 + 2AB + B^2$.

39. Find the area of the quadrilateral whose vertices are (–4, 5), (0, 7), (5, –5) and (–4, –2).

40. If the vertices of a ΔABC are A (–4, 4), B (8, 4) and C (8, 10), find the equation of the straight line along the median from the vertex A.

41. If $\tan^2\alpha = \cos^2\beta - \sin^2\beta$, then prove that $\cos^2\alpha - \sin^2\alpha = \tan^2\beta$.

42. A spherical solid material of radius 18cm is melted and recast into three small solid spherical spheres of different sizes. If the radius of two spheres are 2cm and 12cm, find the radius of the third sphere.

43. Calculate the coefficient of variation of the following data: 20, 18, 32, 24, 26.

44. A die is thrown twice. Find the probability that at least one of the two throws comes up with the number 5 (use addition theorem).

45. (a) The perimeter of the ends of a frustum of a cone are 44 cm and 8.4π cm. If the depth is 14cm, then find its volume.

(OR)

(b) State and prove the angle bisector theorem.

SECTION – IV
(Marks 20)

Note: Answer both the questions choosing either of the alternatives: 2 x 10 = 20

46. (a) Draw a circle of diameter 10cm. From a point P, 13 cm away from its centre and draw two tangents PA and PB to the circle, and measure their lengths.

(OR)

(b) Construct a cyclic quadrilateral ABCD such that AB = 5.5 cm, ∠ABC = 50°, ∠BAC=60° and ∠ACD=30°.

47. (a) Solve graphically $2x^2 + x - 6 = 0$.

(OR)

(b)

x	1	3	5	7	8
y	2	6	10	14	16

Draw the graph for the above table and hence find
(i) the value of y, if $x = 4$.
(ii) the value of x, if $y = 12$.

K.THIRUMURUGAN @ WWW.MATHSTIMES.COM
PGT IN MATHS,GHSS,VALUTHAVUR,VILLUPURAM DT