INDIAN SCHOOL SALALAH

SECOND TERM EXAMINATION, 2018-19

MATHEMATICS

CLASS: XI

Time Allowed: 3 hours Maximum Marks: 100

General Instructions:

i. All questions are compulsory.

ii. This question paper contains 29 questions.

iii. Question 1-4 in Section A are very short-answer type questions carrying 1 mark each.

iv. Question 5-12 in Section B are short-answer type questions carrying 2 marks each.

v. Question 13-23 in Section C are long-answer **I** type questions carrying 4 marks each.

vi. Question 24-29 in Section D are long-answer **II** type questions carrying 6 marks each.

SECTION.A

Questions 1 to 4 carry 1 mark each.

1. Find the domain of the function f(x) $= \frac{x^2+2x+1}{x^2-x-6}$.

2. Find the value of $\sec\frac{19\pi}{4}$

3. In how many different ways can the letters of the word 'KURUKSHETRA' be arranged?

OR

If ${}^nP_r = 840$ and ${}^nC_r = 35$, find the value of 'r'.

4. What is the distance between the lines $y = mx + c_1$ and $y = mx + c_2$?

SECTION.B

Questions 5 to 12 carry 2 marks each.

5. Let n(U) = 850, n(A) = 150, n(B) = 250, $n(A \cap B) = 175$. Find $n(A' \cap B')$.

6. Find domain and range of the function $f(x) = \frac{4-x}{x-4}$.

7. The large hand of a clock is 42cm long. How many centimetres does its extremity move in 20 minutes?

OR

If $x = y\cos\frac{2\pi}{3} = z\cos\frac{4\pi}{3}$, then find the value of $xy + yz + zx$.

8. If $\left(\frac{1-i}{1+i}\right)^{100} = a + bi$ find a and b.

9. Find the number of 4 digit numbers that can be formed by using the digits 1,2,3,4,5 such that at least one digit is repeated.
10. In a G.P, the 3rd term is 24 and the 6th term is 192.Find the 10th term.

OR

Evaluate: $\sum_{i=1}^{11}(2+3^i)$

11. Line through the points (–2, 6) and (4, 8) is perpendicular to the line through the points (8, 12) and (*x*, 24). Find the value of *x*.

OR

If the line $\frac{x}{a}+\frac{y}{b}=1$ passes through the points (2 , -3) and (4 , -5) then find (a, b).

12. Find the centre and the radius of the circle $x^2+y^2+8x+10y-8=0$.

SECTION.C

Questions 13 to 23 carry 4 marks each.

13. If $A=\{1,2,3\}, B=\{2,3,4,5\}$ and $C=\{2,4,6,8\}$ verify that

    a) $A-(A-B)=A\cap B$ b) $A\cap(B-C)=(A\cap B)-(B\cap C)$

14. a) If $P=\{x: x<3, x\in N\}, Q=\{x: x\leq 2, x\in W\}$, where W is the set of whole numbers, then find $(P\cup Q)\times(P\cap Q)$.

    b) Let $A=\{1,2,3,\ldots\ldots\ldots,14\}$. Define a relation R from A to A by $R=\{(x,y): 3x-y=0, \text{where } x,y\in A\}$. Write down domain and range of R.

15. Prove that $a(cosC-cosB)=2(b-c)cos^2\frac{A}{2}$

16. a) Solve the inequality : $\frac{4}{x+1}\leq 3\leq\frac{6}{x+1}$

    b) In drilling world's deepest hole it was found that the temperature T in degree Celsius, x km below the surface of Earth, was given by $T=30+25(x-3), 3<x<15$. At what depth will the temperature be between $200^{\circ}C$ and $300^{\circ}C$?

17. If α and β are different complex numbers with $|\beta|=1$, then find $\left|\frac{\beta-\alpha}{1-\bar{\alpha}\beta}\right|$.

18. i) What is the number of ways of choosing 4 cards from a pack of 52 playing cards? In how many of these (ii) four cards are of the same suit, (iii) two are red cards and two are black cards (iv) are face cards?

OR

If ${}^{n+1}C_{r+1}$: ${}^{n}C_{r} = 11:6$ then find 'n'.

19. The sum of the coefficients of the first three terms in the expansion of $\left(x - \frac{3}{x^2}\right)^n$, $x \neq 0$ being a natural number is 559. Find the term of the expansion containing x^3.

OR

Find the term independent of *x* in the expansion of $\left[\sqrt{x} - \frac{2}{\sqrt{x}}\right]^{18}$

20. If *a, b, c* are in A.P, *b, c, d* are in G.P and $\frac{1}{c}$, $\frac{1}{d}$, $\frac{1}{e}$ are in A.P. Prove that *a, c, e* are in G.P.

OR

The product of three numbers in G.P is 216. If 2, 8, 6, be added to them, the results are in A.P. Find the numbers.

21. Find the equation of the lines which passes through the point (3.4) and cuts off intercepts from the coordinate axes such that their sum is 14.
22. Find the coordinates of the foci, the vertices , the eccentricity and the latus rectum of the ellipse $9x^2 + 25y^2 = 225$.
23. Show that three points A (2, 3, 4) , B (-1, 2,-3) and C (-4,1,-10) are collinear and find the ratio in which C divides AB.

SECTION.D

Questions 24 to 29 carry 6 marks each.

24. a**)** Find the general solution of $\sec^2 2x = 1 - \tan 2x$

b) Prove that $\sin 3x + \sin 2x - \sin x = 4\sin x \cos\frac{x}{2} \cos\frac{3x}{2}$

.OR

a) Prove that $\cos 6x = 32\cos^6 x - 48\cos^4 x + 18\cos x - 1$

b) Find $\sin\frac{x}{2}$ and $\tan\frac{x}{2}$ if $\cos x = \frac{-1}{3}$, *x* is in 3rd quadrant.

25. By using the principle of mathematical induction prove that

$$1.3 + 3.5 + 5.7 + \ldots\ldots + (2n-1)(2n+1) = \frac{n(4n^2+6n-1)}{3} \text{ for all } n \in N.$$

26. a) Write the complex number $\frac{(1+i)(1+\sqrt{3}i)}{1-i}$ in the polar form.

b) If $\frac{(a^2+1)^2}{2a-i} = x + iy$, find $x^2 + y^2$.

27. If the coefficients of a^{r-1}, a^r and a^{r+1} in the expansion of $(1+a)^n$ are in arithmetic progression, prove that $n^2 - n(4r+1) + 4r^2 - 2 = 0$.

28. a) The first, second and last terms of an AP are *a*, *b* and *2a* respectively. Show that its sum is $\frac{3ab}{2(b-a)}$.

b) If *a*, *b*, *c* are in AP, prove that x^a, x^b, x^c are in GP.

OR

a) The 4th term of an AP is equal to 3 times the first term and the 7th term exceeds twice the 3rd term by 1. Find first term and common difference.

b) If the first and the *n*th term of a G.P are *a* and *b*, respectively, and if *P* is the product of *n* terms, prove that $P^2 = (ab)^n$

29. a) Find the equation of the right bisector of the line segment joining the points (3, 4) and (–1, 2).

b) Find the angle between the lines $y = (2-\sqrt{3})(x+5)$ and $y = (2+\sqrt{3})(x-7)$.

OR

a) Show that the tangent of an angle between the lines $\frac{x}{a} + \frac{y}{b} = 1$ and $\frac{x}{a} - \frac{y}{b} = 1$ is $\pm\left(\frac{2ab}{a^2-b^2}\right)$.

b) If the lines $2x + y - 3 = 0$, $5x - ky - 3 = 0$ and $3x - y - 2 = 0$ are concurrent, find the value of *k*.

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