INDIAN SCHOOL SALALAH

ANNUAL EXAMINATION, 2018-19

Subject: Mathematics Time Allowed: 3 hours

Class: XI Maximum Marks: 100

General Instructions:

a. All questions are compulsory.
b. This question paper contains 29 questions.
c. Question 1-4 in Section A are very short-answer type questions carrying 1 mark each.
d. Question 5-12 in Section B are short-answer type questions carrying 2 marks each.
e. Question 13-23 in Section C are long-answer I type questions carrying 4 marks each.
f. 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. Express $5^{\circ}37'30''$ in radian measure.
2. If $z_1 = 2 - i$, $z_2 = -2 + i$, then find $\frac{1}{z_1\bar{z}_2}$.

OR

Find the value of $i^{57} + \frac{1}{i^{125}}$

3. A coin is tossed and then a die is rolled only in case of a head is shown on the coin. Describe the sample space for the experiment.
4. Write the contrapositive of the statement: 'If the cable is out, then we do not watch the T.V'

SECTION.B

Questions 5 to 12 carry 2 marks each

5. Let $A = \{x: x + 5 = 5\}$. Is A an empty set? Justify your answer.
6. Find the solution set of the system of inequalities: $4x + 5 > 3x$, $-(x + 3) + 4 \leq -2x + 5$
7. How many four digit numbers can be formed with the digits 1, 2, 3 and 4 which are lying between 1000 and 3000.

OR

How many words with or without meaning can be formed using all the letters of the word MONDAY, assuming that no letter is repeated, if all letters are used but the first letter is a vowel?

8. Express $\frac{2-i}{(1-2i)^2}$ in the form $a + ib$.

9. If $f(x) = \frac{x-1}{x+1}$, then prove that $f\left(\frac{1}{x}\right) = -f(x)$

10. Find r^{th} term of an A.P, whose 6th term is 12 and 8th term is 22.

OR

In a G.P series, the product of the first three terms is $\frac{27}{8}$. Find the middle term.

11. 6 boys and 6 girls sit in a row randomly, find the probability that all the 6 girls sit together.

OR

If A and B are mutually exclusive events, $\mathrm{P(A)} = 0.35$ and $\mathrm{P(B)} = 0.45$. Find $\mathrm{P(A' \cap B')}$.

12. If $y = ax^2$, prove that $x\frac{dy}{dx} = 2y$

SECTION.C

<u>Questions 13 to 23 carry 4 marks each</u>

13. In a survey of 60 students, it was found that 30 had taken Mathematics, 27 had taken Physics and 22 had taken Chemistry, 8 had taken Mathematics and Chemistry, 12 had taken Mathematics and Physics, 6 had taken Physics and Chemistry and 5 had all three subjects. Find the number of students that had taken

   a) Physics and Chemistry but not Mathematics

   b) At least one of the subjects

   c) None of three subjects.

14. a) If $A = \{1,2,3\}, B = \{4\}$ and $C = \{5\}$, show that $A \times (B - C) = (A \times B) - (A \times C)$

   b) Determine the domain and the range of the relation R defined by

   $R = \{(x + 1, x + 5): x \in \{0,1,2,3,4,5\}\}$

15. Prove that $\frac{\sin 5x - 2\sin 3x + \sin x}{\cos 5x - \cos x} = \tan x$

OR

Prove that $a\cos A + b\cos B + c\cos C = 2a\sin B\sin C$

16. A group consists of 4 girls and 7 boys. In ow many ways can a team of 5 members be selected if the team has

   a) at least one boy and one girl b) at least three girls

17. If a, b, c, d are in G.P, prove that $(a^n + b^n), (b^n + c^n), (c^n + d^n)$ are in G.P.

18. Find the square root of $(7-24i)$

OR

If $z=x-iy$ and $z^{\frac{1}{3}}=p+iq$, then show that $\dfrac{\frac{x}{p}+\frac{y}{q}}{p^2+q^2}=-2$

19. If 'p' and q are he lengths of perpendiculars from the origin to the lines $x\cos\theta-y\sin\theta=k\cos2\theta$ and $x\sec\theta+y\operatorname{cosec}\theta=k$, respectively, prove that $p^2+4q^2=k^2$.

OR

Find the equation of the straight line which passes through the points (3, 4) and have intercepts on the axes such that their sum is 14.

20. Find coordinates of the foci ,vertices, eccentricity and the length of the latus rectum of the hyperbola $16x^2-9y^2=576$.

21. Show that $(0,7,10),(-1,6,6)$ and $(-4,9,6)$are the vertices of an isosceles right triangle.

22. If 4-digit number greater than 5000 are randomly formed from the digits 0, 1, 3, 5 and 7 what is the probability of forming a number divisible by 5 when,

a) the digits are repeated ? b) the repetition of digits is not allowed ?

23. a) Evaluate: $\lim\limits_{x\to\frac{\pi}{2}}\dfrac{1-\sin^3x}{\cos^2x}$

b) Find $f'(x)$ where $f(x)=\dfrac{\sin(x+9)}{\cos x}$

SECTION.D

Questions 24 to 29 carry 6 marks each

24. Prove that $\cos2x\cos\frac{x}{2}-\cos3x\cos\frac{9x}{2}=\sin5x\sin\frac{5x}{2}$

OR

a) If $\tan x=\frac{3}{4}, \pi<x<\frac{3\pi}{2}$, find the value of $\sin\frac{x}{2}$ and $\cos\frac{x}{2}$.

b) Find general solution of the equation $\sin2x+\cos x=0$

25. Solve the following system of inequalities graphically:

$2x+y\geq2,\quad 2x-2y\leq4,\quad 4x+5y\leq20,\quad x,y\geq0$

26. Find the expansion of $(3x^2 - 2ax + 3a^2)^3$ by using binomial theorem.

OR

If three consecutive coefficients in the expansion of $(1 + x)^n$ are in the ratio 6:33:110, find 'n'.

27. By using principle of mathematical induction prove that

$2.1^2 + 3.2^2 + 4.3^2 + \ldots\ldots\ldots + (n + 1).n^2 = \frac{n(n+1)(n+2)(3n+1)}{12}, \forall n \in N$

28. Find the perpendicular distance from the origin of the line joining the points $(\cos\theta, \sin\theta)$ and $(\cos\emptyset, \sin\emptyset)$.

OR

a) Find the angle between the lines whose intercepts on the axes are (a,-b) and (-a,-b) respectively.

b) Reduce the straight line $x + \sqrt{3}y + 4 = 0$ to its normal form.

29. Find mean and variance for the following frequency distribution:

Class	0-30	30-60	60-90	90-120	120-150	150-180	180-210
Frequency	2	3	5	10	3	5	2

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