Roll Number			

INDIAN SCHOOL MUSCAT
FIRST TERM EXAMINATION
MATHEMATICS

CLASS: XI   Sub Code: 041   Time Allotted: 3 Hrs

25.09.2018   Max Marks: 100

General Instructions: This question paper consists of 29 questions divided into 4 sections.
 Section A consists of 4 questions of **one** mark each.
 Section B consists of 8 questions of **two** marks each.
 Section C consists of 11questions of **four** marks each.
 Section D consists of 6 questions of **six** marks each.
All questions are compulsory; however, internal choice is given for 3 questions in section C and 3
questions in section D.

SECTION-A (4 x 1 = 4 marks)

1. Find the value of $\cot\left(\dfrac{-15\pi}{4}\right)$

2. If $f(x)=ax+b$, where a and b are integers, $f(-1)=-5$ and $f(3)=3$, then find a and b.

3. If $U=\{x: x\in N \text{ and } x<10\}$, $A=\{x: x=2y+1 \text{ and } y\in N\}$, $B=\{x: x=3y-1 \text{ and } y\in N\}$, list the elements of $A'\cup B$.

4. Find z, if $|z|=4$ and $\arg(z)=\dfrac{5\pi}{6}$.

SECTION- B (8 x 2 = 16 marks)

5. Find the real numbers x and y if $(x-iy)(3+5i)$ is the conjugate of $(-1-3i)$.

6. The mean of 200 items is 48 and their standard deviation is 3. Find the sum of the items and sum of squares of all items.

7. Express the complex number $\dfrac{5+\sqrt{2}i}{1-\sqrt{2}i}$ in the form $a+ib$.

8. If R is the relation on N defined by $R=\left\{(x,y): y=x+\dfrac{12}{x}, x, y\in N\right\}$, then find

   (i) R in Roster form   (ii) Domain of R   (iii) Range of R.

9. Find x if $\dfrac{x}{11!}=\dfrac{1}{10!}+\dfrac{1}{9!}$

10. A and B are two sets such that $n(A-B)=20+x$, $n(B-A)=3x$ and $n(A\cap B)=x+1$. Draw a Venn diagram to illustrate this information. Also, if $n(A)=n(B)$, find
    (i) the value of x (ii) $n(A\cup B)$.

11. The minute hand of a clock is 21 cm. How far does its tip move in 25 minutes?

12. Evaluate: $\cos\left(\dfrac{3\pi}{2}+x\right)\cos(2\pi+x)\left[\cot\left(\dfrac{3\pi}{2}-x\right)+\cot(2\pi+x)\right]$.

SECTION- C (11 x 4 = 44 marks)

13. Solve: $5(2x-7)-3(2x+3)\le 0$; $2x+19\le 6x+47$ and represent the solution on the number line.

14. Using Principle of Mathematical Induction prove that $10^{2n-1}+1$ is divisible by 11, for all $n\in N$.

15. A committee of 12 is to be formed from 8 men and 9 women. In how many ways can this be done if (i) at least 5 women have to be included in the committee? (ii) In how many of these committee the women are in majority?

(OR)

Prove that $^{n}C_{r}+{^{n}C_{r-1}}={^{n+1}C_{r}}$

16. If A ={1, 2, 3, 4, 5}, B ={1, 3, 5, 8}, C ={2, 5, 7, 8}, Verify that :
    (i) $A-(B\cup C)=(A-B)\cap(A-C)$ (ii) $A\cap(B-C)=(A\cap B)-(B\cap C)$

17. Solve: $4\sin x\cos x+2\sin x+2\cos x+1=0$.

18. Find domain and range of the function: $f(x)=\sqrt{9-x^{2}}$

(OR)

If $f=\left\{\left(x,\dfrac{x^{2}}{1+x^{2}}\right):x\in R\right\}$ be a function from R into R. Determine the range of f.

19. Express the complex number $\dfrac{1+7i}{(2-i)^{2}}$ in polar form.

20. Find the mean deviation about median for the following data:

x	3	5	7	9	11	13
f	2	7	10	9	5	2

21. Find the number of arrangements that can be made from the letters of the word INDEPENDENCE. In how many of these arrangements   (i) words start with I and end with P   (ii) all the vowels occur together   (iii) all the vowels never occur together?

22. By using Principle of Mathematical Induction, prove for all $n\in N$:
$$\dfrac{1}{2.5}+\dfrac{1}{5.8}+\dfrac{1}{8.11}+\ldots\ldots+\dfrac{1}{(3n-1)(3n+2)}=\dfrac{n}{(6n+4)}$$

(OR)

By Induction, prove that, $1^2 + 2^2 + 3^2 + \ldots\ldots + n^2 > \dfrac{n^3}{3}$ for all $n \in N$.

23. Define the function $f(x) = |x - 2|, x \in R.$ Also draw the graph and find its domain and range.

SECTION-D (6 x 6 = 36 marks)

24. Of the members of three athletic teams in a certain school, 21 members are in the basketball team, 26 members are in hockey team and 20 members are in football team. 14 members play hockey and basketball, 15 members play hockey and football, 12 members play football and basketball and 8 members play all the three games. How many (i) members are there in all? (ii) Play only football? (iii) Play hockey and basketball but not football?

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

(OR)

If $2\tan\beta + \cot\beta = \tan\alpha$, prove that $\cot\beta = 2\tan(\alpha - \beta)$

26. Find the square root of the complex number $z = 7 - 24i$

(OR)

Find real θ such that $\dfrac{3 + 2i\sin\theta}{1 - 2i\sin\theta}$ is purely real.

27. Find $\sin\dfrac{x}{2}$, $\cos\dfrac{x}{2}$ and $\tan\dfrac{x}{2}$, if $\tan x = \dfrac{-4}{3}$, where x lies in quadrant IV.

28. Calculate the mean, variance and standard deviation for the following frequency distribution:

Classes	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	6	8	14	10	4	2

(OR)

While calculating the mean and variance of 10 observations, a student, wrongly used the observation 52 instead of the correct observation 25. He obtained the mean and variance as 45 and 16 respectively. Find the correct mean and variance.

29. Solve the following system of inequations graphically:
$x + y \le 4$; $3x + y \ge 4$; $x + 5y \ge 4$; $x \ge 0, y \ge 0$.

End of the Question Paper