AMRITA VIDYALAYAM

ANNUAL EXAMINATION 2018 -'19

Class : XI **Marks : 100**

Time : 3 hrs

MATHEMATICS

GENERAL INSTRUCTIONS:

1. ***All questions are compulsory.***
2. ***This question paper consists of 29 questions divided into four sections A, B, C and D.***
   Section A comprises 4 questions of 1 mark each,
   Section B comprises 8 questions of 2 marks each,
   Section C comprises 11 questions of 4 marks each and
   Section D comprises 6 questions of 6 marks each
3. ***All questions in section A are to be answered in one word, one sentence or as per the exact requirement of the question.***
4. ***There is no overall choice. However, an internal choice has been provided in 4 questions of four marks each and 2 questions of six marks each. You have to attempt only one of the alternatives in all such questions.***
5. ***Use of calculators is not permitted. You may ask for logarithmic tables, if required.***

SECTION - A

1. Find the value of x and y if $(x + 4, x + 2y) = (6, 8)$
2. Convert $40^0\ 20'$ into radian measure.
3. If ${}^nC_8 = {}^nC_2$, find ${}^nC_2$.
4. Write the coordinates of a point in YZ plane.

SECTION - B

5. If $\tan x = -\frac{5}{12}$, find the quadrant in which x can lie. Also find the values of cot x.
6. Solve $\frac{5 - 2x}{3} \leq \frac{x}{6} - 5$.
7. Expand $(x^2 + \frac{3}{x})^4$, $x \neq 0$ using binomial theorem.
8. The fourth term of a GP is 27 and the 7th term is 729. Find the GP.
9. Reduce the equation $x - \sqrt{3}\,y + 8 = 0$ into normal form.
10. Find the distance between the points (1, -3, 4) and (-4, 1, 2).
11. Evaluate $\lim_{x \to \frac{1}{2}} \left(\frac{4x^2 - 1}{2x - 1} \right)$
12. A die has two faces each with number '1' and three faces with number '2' and one face with number '3'. If die is rolled once, determine
    a) P (2) b) P (1 or 3) c) P (not 3)

SECTION - C

13. Let A = {1, 2, 3, ... 14}. Define a relation R from A to A by R = {(x, y) : 3x - y = 0, where x, y ε A}. Write down its domain, codomain and range.
14. Find the general solution of $\sin x + \sin 3x + \sin 5x = 0$.

OR

Prove that $\sin 10^0 \sin 50^0 \sin 60^0 \sin 70^0 = \frac{\sqrt{3}}{16}$.

15. A manufacturer has 600 litres of a 12 % solution of acid. How many litres of a 30 % acid solution must be added to it so that acid content in the resulting mixture will be more than 15 % but less than 18 %.

16. Find n if ${}^{n-1}P_3 : {}^{n}P_4 = 1 : 9$.

OR

In how many different ways can the letters of the word 'ALGEBRA' be arranged in a row if
a) the two A's are together. b) the two A's are not together.

17. Using binomial theorem, prove that $6^n - 5n$ always leaves remainder 1 when divided by 25 for all $n \varepsilon N$.

18. Find the sum of the series 8 + 88 + 888 + ... to n terms.

OR

Find the sum to n terms of the series $3 \times 1^2 + 5 \times 2^2 + 7 \times 3^2 + ...$

19. Find the equation of a line parallel to the line 3x + 4y + 7 = 0 and passing through the intersection of the lines 2x - 5y + 9 = 0 and x + 2y + 3 = 0.

20. Derive the standard equation of parabola.

OR

Find the equation of the ellipse whose length of minor axis is 16 and foci is (0, ± 6).

21. Find the ratio in which the line segment joining the points (4, 8, 10) and (6, 10, -8) is divided by the yz - plane.

22. Find the derivative of 'cos x' from first principle.

23. The letters of the word 'SOCIETY' are placed at random in a row. What is the probability that all the vowels are together? What responsibilities do you have in society?

SECTION - D

24. Solve graphically. $x + y \le 4,\ 3x + y \ge 4,\ x + 5y \ge 4,\ x \ge 3,\ y \le 3,\ x \ge 0,\ y \ge 0$

25. In an AP if the pth term is $\frac{1}{q}$ and qth term is $\frac{1}{p}$, Prove that the sum of the first pq terms must be $\frac{1}{2}(pq + 1)$.

OR

Find the value of n so that $\frac{a^{n+1} + b^{n+1}}{a^n + b^n}$ may be the G M between a and b.

26. If p and q are the length of perpendicular from the origin to the lines x cos q - y sin q = k cos 2q and x sec q + y cosec q = k respectively. Prove that $p^2 + 4q^2 = k^2$.

27. Find the equation of the hyperbola where foci are (0, ± 12) and the length of the latus rectum is 36.

28. Evaluate the following limits.

a) $\lim_{x \to 0} \frac{\tan 8x}{\sin 2x}$ b) $\lim_{x \to 3} \frac{x^4 - 81}{x^2 - 9}$ c) $\lim_{x \to \frac{\pi}{2}} \frac{\cot x}{\frac{\pi}{2} - x}$

OR

Find the derivative of the following.

a) $(x - 2)^2 (2x - 3)$ b) $\frac{4x + 5 \sin x}{3x + 7 \cos x}$ c) $3x^2 + 24$

29. A committee of two persons is selected from two men and two women. What is the probability that the committee will have

a) no man? b) one man? c) two men?