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## FIFTH SEMESTER (CBCSS-UG) DEGREE EXAMINATION, NOVEMBER 2023

Mathematics

MTS 5B 09—INTRODUCTION TO GEOMETRY AND THEORY OF EQUATIONS (2020 Admission onwards)

Time : Two Hours

Maximum: 60 Marks

## Section A

Answer any number of questions. Each question carries 2 marks. Ceiling is 20.

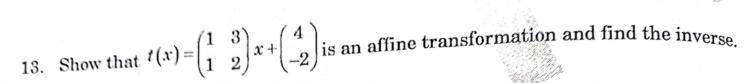
- 1. Find equation of the normal to the parabola  $y^2 = x$  at the point (1,1).
- 2. Find the foci of the hyperbola  $\frac{x^2}{\alpha} \frac{y^2}{4} = 1$ .
- What is the reflection property of the hyperbola?
- Find the matrix form of the conic  $11x^2 + 4xy + 14y^2 4x 28y 16 = 0$ .
- Show that  $x^3 + x^2 5x + 3$  is divisible by x + 3.
- Write a cubic equation with the roots 1,2,3.
- State the Identity Theorem.
- Find the multiplicity of the root x = 1 of the polynomial  $f(x) = x^n nx + n 1$ .
- Show that the polynomial  $f(x) = x^{11} 1$  has no roots in the interval (-1,0).
- Find  $\Delta$  of the equation  $x^3 10x 12 = 0$ .
- 11. Show that  $\sqrt{2} \sqrt{3}$  is a root of the equation  $x^4 10x + 1 = 0$ .
- Find the cubic resolvent corresponding to the bi quadratic equation  $x^4 + 4x 1 = 0$ .

(Ceiling 20)

Turn over

## Section B

Answer any number of questions. Each question carries 5 marks. Ceiling is 30.



- (i) State the Fundamental theorem of Affine Geometry. 14.
  - Determine the affine transformation which maps the points (0, 0), (1, 0) and (0, 0)points (3, 2), (5, 8) and (7, 3), respectively.
- Find the rational roots of the equation  $6x^4 7x^3 + 8x^2 7x + 2 = 0$ .
- Solve the equation  $3x^3 16x^2 + 23x 6 = 0$  if the product of two roots is 1.
- Factorize in to real linear and quadratic factors of the polynomial  $f(x) = x^4 + 1$ .
- Show that the necessary and sufficient condition for an equation  $x^3 + px + 1 = 0$  to have and distinct roots is  $p^3 < -27/4$ .
- 19. How many real roots of the equation  $f(x) = x^4 32x + 1 = 0$ .

## Section C

Answer any one question. The question carries 10 marks.

- 20. Prove that the conic with the equation  $3x^2 10xy + 3y^2 + 14x 2y + 3 = 0$  is a hyperbola. its centre, and its major and minor axis.
- 21. Solve the cubic equation  $x^3 + x^2 2 = 0$  by using Carden's formula.

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