

RAN-2303080303060604

M. Sc. (Sem.-III) Examination October - 2025
Mathematics - Skill Based Elective Paper : Curve Theory

Time: 2 Hours]
[Total Marks: 30
સૂચના : / Instructions

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the above details on your answer book
- (2) Attempt ANY SIX out of the following NINE questions.
- (3) Each question carries 5 marks.
- (4) Follow usual notations.

Seat No.:

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Student's Signature

- Q.1.** State Serret- Frenet formulae and prove any two of them.
- Q.2.** Prove that for any curve $[b', b'', b'''] = \tau^3[K'\tau - \tau'K] = \tau^5 \frac{d}{ds} \left(\frac{K}{\tau} \right)$
- Q.3.** For the curve $x = a(3u - u^3)$, $y = 3au^2$, & $z = a(3u + u^3)$; show that the curvature and torsion are equal.
- Q.4.** Define: Circular Helix. Show that if the curvature and torsion are both constant, then the curve is circular helix.
- Q.5.** Define Osculating Sphere. Find the centre and radius of spherical curvature of a space curve.
- Q.6.** Show that the radius of spherical curvature of a circular helix $x = a \cos \theta$, $y = a \sin \theta$, $z = a\theta \cot \alpha$ is equal to the radius of circular curvature.
- Q.7.** For Bertrand curves show that the distance between the corresponding points of the two curves is constant.
- Q.8.** Find the involutes of the circular helix:

$$x = a \cos \theta, y = a \sin \theta, z = a\theta \tan \alpha.$$
- Q.9.** Find the equation of evolute of a space curve.
