A-0629

Total Pages : 3 **Roll No. ....**

MT–504

M.A./M.Sc. MATHEMATICS (MAMT/MSCMT)

(Differential Geometry and Tensor–I)

1st Semester Examination, Session December 2024

Time : 2:00 Hrs. Max. Marks : 70

Note* :–** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these Sections according to the detailed instructions given therein. ***Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.

Section–A

Long Answer Type Questions $2 \times 19 = 38$

***Note* :–** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. State and prove Serret-Frenet formulae.

2. Define osculating sphere. Find the radius and centre of sphere of the curvature.

3. Define developable surfaces. Prove that the generators of a developable surface are tangents to curve.

4. Find the torsion and curvature of asymptotic lines on any surface.

5. Find the principal section and principal curvature of the surface :

$$x = a\,(u + v),\ y = b\,(u - v),\ z = uv.$$

Section–B

Short Answer Type Questions 4×8=32

***Note* :–** Section 'B' contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. Find the osculating plane at the point 't' on the helix $x = a \cos t,\ y = a \sin t,\ z = ct$.

2. Define involute of a space curve and also find the curvature of involute.

3. State and prove Meusnier's theorem.

4. Prove that the torsion of the two Bertrand curves have the same sign and their product is constant.

5. Find the curvature of the normal section of a given surface.

6. Prove that asymptotic lines are orthogonal if the surface is minimal.

7. Define the following :

   (i) Principal normal

   (ii) Principal curvature

8. Find the evaluate of the circular helix given by :

$$x = a \cos \theta, y = a \sin \theta, z = a \theta \tan \alpha.$$

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