Government General Degree College,Dantan-II

Internal Assessment/4th Semester/Session : 2019-2020

Core-10

Subject-**Mathematics**(Honours)

Full marks-30

1. Answer **any six** questions: $6 \times 5 = 30$
2. The necessary and sufficient condition for a vector $\vec{r} = \vec{f}(t)$ to have a constant magnitude is $\vec{f}.\frac{d\vec{f}}{dt} = 0$.
3. Prove that, curl curl $\vec{f} = \vec{\nabla}(\vec{\nabla}.\vec{f}\,) - \vec{\nabla}^2\vec{f}$.
4. Evaluate $\iint_R (x^2 + y^2)dx\,dy$ over R bounded by y=x^2, x=2, y=1 .
5. Find the equation of the tangent plane and the normal to the surface xz^2+ x^2y= z at the point (1,-3,2).
6. Define irrotational and solenoidal vector. Find div$\vec{F}$ and curl$\vec{F}$ when $\vec{F}$ =grad $(x^3 + y^3 + z^3 - 3xyz)$.
7. If $\vec{a} = 3t^2\hat{\imath} + t\,\hat{\jmath} - t^3\hat{k}$ and $\vec{b} = sint\hat{\imath} - 2\cos t\,\hat{\jmath}$ then find $\frac{d}{dt}(\vec{a} \times \vec{b})$.
8. If $\vec{r} = (a\,cost)\hat{\imath} + (a\sin t)\hat{\jmath} - (at\tan\alpha)\hat{k}$, then prove that $[\frac{d\,\vec{r}}{dx}\ \frac{d^2\,\vec{r}}{dt^2}\ \frac{d^3\,\vec{r}}{dt^3}] = a^3\tan\alpha$
9. Find $\vec{t}\,, \vec{b}\,, \vec{n}$ for the circular helix $\vec{r} = a(\cos\theta\,,\ \sin\theta,\ \theta\cot\beta)$. Find also expression for curvature and torsion at a point on the curve.