Paper GE02(Math) **Semester II** **2021**

End Sem **Full Marks 100** **Time :3hrs**

Group –A

(Compulsory)

1. Answer the following question 1X10=10

(i) Define rational function.

(ii) Write the formula for integration by parts.

(iii) Define odd and even function.

(iv) What is the symmetry of the curve when there is even power of x present in the equation?

(v) For polar curve what is the symmetry if Θ is replaced with – Θ and remain unchanged?

(vi) Find unit vector for $3\vec{\imath} + 4\vec{\jmath}$.

(vii) Define vector point function

(viii) Write the necessary condition so that a vector has constant direction.

(ix) What is the geometric al meaning of scalar triple product.

(x) Define divergence

2. Evaluate $\int x\tan^{-1} x\, dx$ 5

3. Prove that $\vec{\nabla} . \vec{r} = 3$. where $\vec{r} = x\vec{\imath} + y\vec{\jmath} + z\vec{k}$ 5

Group –B

Answer any four

4. (a) Evaluate $\int \frac{dx}{\sin x + \sin 2x}$ 10

(b)Evaluate $\int \frac{dx}{(2+x)\sqrt{1+x}}$ 10

5. (a)Evaluate $\int_0^{\pi/2} \log \sin x\, dx$ 10

(b) Find reduction formula for $\int_0^{\frac{\pi}{2}} \sin^n x dx$ 10

6. (a) Find area and perimeter of circle $x^2+y^2=a^2$. 10

(b) Find volume and surface area of sphere. 10

7. (a)A particle moves along the curve $x=t^3+1$,$y=t^2$, $z=2t+5$ where t is the time. Find component of its velocity and acceleration at t=1 in the direction $\vec{\imath} + \vec{\jmath} + 3\vec{k}$ 10

(b) Prove that $\vec{\nabla} \times \vec{r} = 0$ 10

8. (a) A particle moves so that its position vector is given by $\vec{r} = \cos wt\, \vec{\imath} + \sin wt \vec{\jmath}$ where w is constant show $\vec{r} \times \frac{d\vec{r}}{dt}$ *is constant vector* 10

(b)Prove that $\vec{\nabla} . (\vec{\nabla} \times \vec{A}) = 0$ 10

9. (a) If $r = |\vec{r}\,|$ where $\vec{r} = x\vec{\imath} + y\vec{\jmath} + z\vec{k}$ Prove that $\vec{\nabla}\left(\frac{1}{r}\right) = -\frac{\vec{r}}{r^3}$ 10

(b) If $f(x,y,z)=3x^2y-y^3z^2$, Find $\vec{\nabla}f$ at the point (1,-2.-1) 10