Mid Term Examination, 2015-16

Mathematics - II **Paper Code -AHM 2001**

Time: - 90 Min. **Max. Marks:-20**

Section - A

Note: Attempt All Questions. **($1\times 5 = 05$ Marks)**

1) A fluid motion is given by $\vec{v} = (x^2 - 3x)\hat{i} + (y+2)\hat{j}$. Find the points in xy plane where the velocity is zero.

2) If $\phi = xyz$ is increases and decreases most rapidly in the direction of $\vec{v}$ and $\vec{u}$ respectively. Find the angle between $\vec{v}$ and $\vec{u}$.

3) If $\vec{A} = (xz+3)\hat{i} + (xy+2)\hat{j} + (yz+5)\hat{k}$, then find where the given vector is irrotational.

4) Evaluate $\iint_s \vec{a}.\hat{n}\,ds$ where $\vec{a}$ is constant vector and S is any closed surface.

5) Calculate Fourier coefficient 'a_0'for $f(x) = |x|\,;\, -\pi < x < \pi$.

Section -B

Note: Attempt Any Three questions. **($3\times 2 = 6$ Marks)**

1) Find the angle between the surfaces $x^2 + y^2 + z^2 = 9$ and $x^2 + y^2 - z = 3$ at the points (2,-1,2)

2) Find directional derivative of $\phi(x,y,z)=x^2-y^2+2z^2$ at (1,2,3) in the direction $\vec{v}=4\hat{i}-2\hat{j}+\hat{k}$.

3) If $\vec{\omega}$ is a constant vector and $\vec{r}$ is position vector. Then show that $\vec{v}$ is solenoidal ,where $\vec{v}$ is normal to the both $\vec{\omega}$ and $\vec{r}$.

4) Evaluate $\oint_c (e^x dx+2y dy-dz)$ where C is closed curve bounded by $x^2+y^2=4$ and $z=2$.

Section - C

Note: Attempt Any Three questions. **($3\times3=9$ Marks)**

1) Prove that: $div(r^n\vec{r})=(n+3)r^n$ where $\vec{r}=x\hat{i}+y\hat{j}+z\hat{k}$.

2) Show that the vector field defined by $\vec{F}=2xyz^3\hat{i}+x^2z^3\hat{j}+3x^2yz^2\hat{k}$ is irrotational and find the scalar potential.

3) Verify Green's theorem in the plane for $\int_c (x^2y dx+x^2 dy)$ where C is boundary of the triangle with vertices (0,0); (1,0) ; (1,1).

4) Obtain the Fourier series for $f(x)=x^2$, for $0\le x\le 2\pi$.