United International **University**

School of Science and Engineering

Final Assessment Trimester: Summer 2020

Course Title: Coordinate Geometry and Vector Analysis

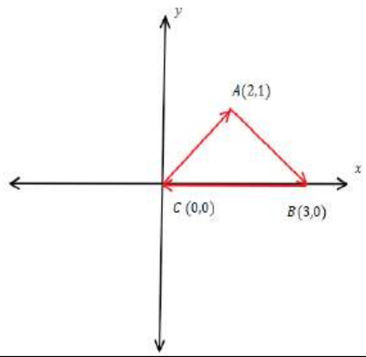
Course Code: Math 201 Marks: 25

Time: **1 hour 15 minutes**

Additional Time for Uploading answer script: 15 Min.

Total time: 1hour 30minutes

Answer all questions.

1. Evaluate $\int_c (\boldsymbol{x}+\mathbf{1})\boldsymbol{dx}+\mathbf{2}\boldsymbol{ydy}$ along the curve shown in the figure 	**[5]**
2.Consider, $\boldsymbol{F}(\boldsymbol{x},\boldsymbol{y}) = 2xe^{y}\boldsymbol{i} + x^2e^{y}\boldsymbol{j}$ **i)** Show that $\boldsymbol{F}$ is a conservative vector field on the entire $\boldsymbol{xy}$ −plane. **ii)** Find the potential function $\boldsymbol{\phi}$. **iii)** Find $\int_{(\mathbf{0},\mathbf{0})}^{(\mathbf{3},\mathbf{2})} \boldsymbol{F}.\boldsymbol{dr}$ using **ii)** **Or** Using Green's theorem find the value of $\oint_c \boldsymbol{F}.\boldsymbol{dr}$ Where $\boldsymbol{F}(x,y) = (e^{3x}-y^2)\boldsymbol{i} + (y+2x^2)\boldsymbol{j}$ and C is the closed circle with parametric equations $\boldsymbol{x} = \mathbf{3}\boldsymbol{cost}, and\ \boldsymbol{y} = \mathbf{3}\ \boldsymbol{sint}$.	**[5]**
3. Evaluate the surface integral $\iint_{\sigma}(\boldsymbol{xy}+\mathbf{1})\ \boldsymbol{ds}$; σ is the part of the plane $\boldsymbol{x}+\boldsymbol{y}+\boldsymbol{z} = \mathbf{1}$ that lies in the first octant.	**[5]**
4. Find the flux of the vector field $\boldsymbol{F}(x,y,z) = 2x\boldsymbol{i} - y\boldsymbol{j} + 2z\boldsymbol{k}$ across σ, where σ is the portion of the surface $\boldsymbol{z} = \mathbf{4} - \boldsymbol{x}^{\mathbf{2}} - \boldsymbol{y}^{\mathbf{2}}$ that lies above the xy − plane, and suppose that σ is oriented up. **Or** Use the Divergence Theorem to find the outward flux of the vector field $\boldsymbol{F}(x,y,z) = 2x^3\boldsymbol{i} + 2y^3\boldsymbol{j} + 2z^3\boldsymbol{k}$ across the surface of the region that is enclosed by $\boldsymbol{z} = \sqrt{\mathbf{36} - \boldsymbol{x}^{\mathbf{2}} - \boldsymbol{y}^{\mathbf{2}}}$ and the plane $\boldsymbol{z} = \mathbf{0}$.	**[5]**
5. Use cylindrical coordinate systems to evaluate: $$\int_{-3}^{3}\int_{-\sqrt{9-x^2}}^{\sqrt{9-x^2}}\int_{0}^{9-2(x^2+y^2)} 3x^2\ dzdydx$$	**[5]**