King Saud University
Department Of Mathematics.
M-203 [Final Examination]
(Differential and Integral Calculus)
(II-Semester 1436/1437)

Max. Marks: 40 Time: 3 hrs

Marking Scheme: Q.No:1[4+3+3], Q.No:2[3+4+3], Q.No:3[~~4~~ 5+~~4~~ 5+4+6]

Q. No: 1 (a) Find the interval of convergence and radius of convergence of the power series $\sum_{n=1}^{\infty}(-1)^n \frac{(2x-1)^n}{n+1}$.

(b) Find the Taylor series for the function $f(x)=x^4+x-2$ at $c=1$.

(c) Discuss the convergence of the sequence $\left\{\left(\frac{\pi}{2}-\tan^{-1} n\right)^{1/n}\right\}_{n=1}^{\infty}$.

Q. No: 2 (a) Find the area of the surface $z=xy$ lying over the plane region $x^2+y^2=1$.

(b) Find the centroid of the solid region bounded by the graphs of $z=\sqrt{16-x^2-y^2}$ and $z=0$.

(c) Use cylindrical coordinates to find the mass of the solid bounded by the graphs of $z=\sqrt{16-x^2-y^2}$ and $z=0$. The density at a point P(x,y,z) is $\delta(x,y,z)=kz$.

Q. No: 3 (a) Prove that the line integral $\int_C \vec{F}\bullet d\vec{r}$ is independent of path and find its value if $\vec{F}(x,y)=(x+y^2)\vec{i}+(2xy+3y^2)\vec{j}$ and C is plane curve from the point (0,0) to the point (1,2).

(b) Use Green's theorem to evaluate $\oint_C (2y^2-3y)dx+4xydy$ where C is the boundary of the plane region R that lies outside the circle $x^2+y^2=4$ and inside the circle $x^2+y^2=9$.

(c) Use divergence theorem to evaluate the flux $\iint_S \vec{F}\cdot\vec{n}\ dS$, where S is the cube bounded by the planes $x=0, x=a, y=0, y=a, z=0$, and $z=a$ and $\vec{F}(x,y,z)=2x\vec{i}-2y\vec{j}+z^2\vec{k}$.

(d) Verify Stokes's theorem for $\vec{F}(x,y,z)=y^2\vec{i}+x\vec{j}+z^2\vec{k}$ and S is the part of the plane $y+z=2$ that lies inside the cylinder $x^2+y^2=1$.