Mid-West University

# Examinations Management Office

Final Examinations-2080

Bachelor level/ B. Sc. /2nd Semester — Full Marks: 60

Time: 3 hours — Pass Marks:30

**Subject: Calculus II (MTH423/323)**

*Candidates are required to give their answer in their own words as far as practicable. The figures in the margin indicate full marks.*

**Long answer questions:** **[4x6=24]**

1. Find the area of the region that lies inside the circle r = 3 Sin $\theta$ and outside the cardiod r = 1 + Sin $\theta$ .
2. Show that the harmonic series.

   $\sum_{n=1}^{\infty}\frac{1}{n} = 1+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}+\ldots\ldots\ldots$ is divergent.

   Or

   Find the Maclaurin Series.

   $F(x) = \sum_{n=0}^{\infty}\frac{f^n(0)}{n!}x^n = f(0)+\frac{f'(0)}{1!}+\frac{f''(0)}{2!}x^2+\cdots$
3. If $\theta$ is the angle between the vectors $\vec{a}$ *and* $\vec{b}$, then find $\vec{a}\,.\,\vec{b} = |\vec{a}||\vec{b}|\cos\theta$.
4. Solve the equation y'' + y' - 2y = $x^2$.

**Short answer questions:** **[6x4=24]**

5. Show that the surface area of a sphere of radius r is $4\pi r^2$.
6. Sketch the conic, r = $\frac{12}{2+4\,Sin\,\theta}$.
7. Test the series $\sum_{n=1}^{\infty}(-1)^n\frac{n^3}{3^n}$ for absolute convergence.
8. Find the domain of the Bessel function of order zero defined by $J_o(x) = \sum_{n=0}^{\infty}\frac{(-1)^n x^{2n}}{2^{2n}(n!)^2}$ .
9. Find parametric and symmetric equations of the line that passes through the points A (2, 4, -3) and B (3, -1, 1).
10. Find an equation of the plane through the point (2,4,1) with normal vector $\vec{n} = <2,3,4>$. Find the intercepts and sketch the plane.

    Or

    Sketch the graph of the surface z = $x^2$.

**Very short answer questions.** **[(3x2)2=12]**

11. a. Define Parametric Equations and Polar equations.

    b. Plot the points whose Polar coordinates are

    i. $(2,-\frac{2\pi}{3})$ ii. $(-3,\frac{3\pi}{4})$
12. a. If the series $\sum_{n=1}^{\infty}a_n$ is convergent, then $\lim_{n\to\infty}a_n = 0$.

    b. Define monotonic Sequences.
13. a. If direction angles of a non-zero vector $\vec{a}$ are the angles $\alpha, \beta$ *and* $\gamma$, that $\vec{a}$ makes with the positive x, y and z axes then prove that $Cos^2\alpha + Cos^2\beta + Cos^2\gamma = 1$.

    b. Solve the equation y'' + y'- 6 = 0.

**The End**