Bago University

Department of Mathematics

Second Semester Examination, September 2019

Second Year (B.Sc)

(Chemistry and Physics Specializations)

Math-2004

Mathematics II

Time Allowed: (3) hours

Answer All Questions.

1.(a) Reduce to first order and solve $x^2 y'' - 5xy' + 9y = 0$, $y_1 = x^3$.

 (b) Solve the initial value problem $y'' + 4y = -12\sin 2x$, $y(0) = 1.8$, $y'(0) = 5.0$ by using undetermined coefficients method.

2. (a) Solve $y'' + 9y = \sec 3x$ by variation of parameter.

 (b) Solve the initial value problem

 $x^3 y''' - 3x^2 y'' + 6xy' - 6y = 0$, $y(1) = 2$, $y'(1) = 1$, $y''(1) = -4$.

3. (a) Solve the ODE $(D^3 + 4D)y = \sin x$ by using undetermined coefficient.

 (b) Determine the radius of convergence of $\sum\limits_{m=0}^{\infty} x^m$.

4. (a) Solve the ODE $x(x-1)y'' + (3x-1)y' + y = 0$ by using Frobenius method.

 (b) Prove that the radius of curvature of the curve with parametric equations $x = x(s)$,

 $y = y(s)$, $z = z(s)$ is given by $\rho = \left[\left(\dfrac{d^2 x}{ds^2} \right)^2 + \left(\dfrac{d^2 y}{ds^2} \right)^2 + \left(\dfrac{d^2 z}{ds^2} \right)^2 \right]^{-\frac{1}{2}}$.

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

 (b) Prove that $\nabla^2 \left(\dfrac{1}{r} \right) = 0$.

6.(a) Show that the equations of the plane parallel to the join of $(3, 2, -5)$ and $(0, -4, -11)$ and passing through the points $(-2, 1, -3)$ and $(4, 3, 3)$ is $4x + 3y - 5z = 10$.

 (b) Find the magnitude and the equations of the line of shortest distance between the two lines: $\dfrac{x-3}{-1} = \dfrac{y-4}{2} = \dfrac{z+2}{1}$; $\dfrac{x-1}{1} = \dfrac{y+7}{3} = \dfrac{z+2}{2}$.

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