Department of Mathematics
IIT Kharagpur
MA20103 Partial Differential Equations
Autumn 2016 - Class Test, Time: 1 hr.; Max. Marks: 10, Number of students: 424

Roll Number: ————————- Name:———————————— Signature:————————

Note: Please follow the notations and instructions: Answer all the questions. prime ($'$): denotes derivative with respect to x. No queries will be entertained during the examination. Please show the working in the attached sheet and place final answers on this question cum answer paper. Write your Roll No., Name and put signature at space provided on this sheet. No part marking.

1. **[2 marks]** The polynomial solution of the following linear second order ODE: $(1-x^2)y'' - 2xy' + 12y = 0$ is:

2. **[1 mark]** The value of $P_4(1/2)$ (where $P_n(x)$ denotes the Legendre polynomial of order n) is:

3. **[1 mark]** The value of $\int_0^{\frac{\pi}{2}} P_3(\cos 2\theta) \sin 2\theta d\theta$ is:

4. **[1 mark]** For the linear second order ODE: $(x^2-25)y'' + (x-5)y' + y = 0$, the singular points are:

5. **[2 marks]** Consider the linear second order ODE: $5xy'' + 3y' + x^2y = 0$ for which we are seeking series solution by Frobenius method, about $x = 0$. If the corresponding indicial equation is $f(r) = 0$, then $f(r) =$

6. **[2 marks]** If the general solution of the linear second order ODE: $4x^2y'' + 4xy' + (64x^2 - 9)y = 0$ is of the form $y(x) = AJ_a(bx) + BJ_c(dx)$, where A, B are arbitrary constants, J_n denotes Bessel function of order n, then $a =$ $\quad$, $b =$ $\quad$, $c =$ $\quad$, $d =$

7. **[1 mark]** If we wish to classify exclusively as semi-linear / quasi-linear / non-linear, the PDE $(3x^2+y)\frac{\partial z}{\partial x} - (4x^2+z^2)\frac{\partial z}{\partial y} = e^x z^2$ is: (z: dependent variable; x, y: independent variables)

Department of Mathematics
IIT Kharagpur
MA20103 Partial Differential Equations
Autumn 2016 - Class Test, Time: 1 Hr.; Max. Marks: 10, Number of students: 424

Roll Number: ————————- Name:———————————— Signature:————————

Note: Please follow the notations and instructions: Answer all the questions. prime ($'$): denotes derivative with respect to x. No queries will be entertained during the examination. Please show the working in the attached sheet and place final answers on this question cum answer paper. Write your Roll No., Name and put signature at space provided on this sheet. No part marking.

1. **[2 marks]** The polynomial solution of the following linear second order ODE: $(1-x^2)y'' - 2xy' + 20y = 0$ is:

2. **[1 mark]** The value of $P_3(3/2)$ (where $P_n(x)$ denotes the Legendre polynomial of order n) is:

3. **[1 mark]** The value of $\int_0^{\pi} P_3(\cos\theta)\sin 2\theta d\theta$ is:

4. **[1 mark]** For the linear second order ODE: $(x^2-9)y'' + (x-2)y' + y = 0$, the singular points are:

5. **[2 marks]** Consider the linear second order ODE: $3xy'' + 2y' + x^2y = 0$ for which we are seeking series solution by Frobenius method, about $x = 0$. If the corresponding indicial equation is $f(r) = 0$, then $f(r) =$

6. **[2 marks]** If the general solution of the linear second order ODE: $9x^2y'' + 9xy' + (243x^2 - 25)y = 0$ is of the form $y(x) = AJ_a(bx) + BJ_c(dx)$, where A, B are arbitrary constants, J_n denotes Bessel function of order n, then $a =$ $\quad, b =$ $\quad, c =$ $\quad, d =$

7. **[1 mark]** If we wish to classify exclusively as semi-linear / quasi-linear / non-linear, the PDE $(3x^2 - y)z_x - (4x^2 + y^2)z_y = e^x z^2$ is: (z: dependent variable; x, y: independent variables)