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Code No.

FACULTY OF SCIENCE

M. Sc. I – Semester Examination, December 2015

Subject : Maths / Applied Maths

Paper – V : Mathematical Methods

Time : 3 Hours **Max. Marks**

Note : Answer all questions from Part–A and Part–B. Each question carries 4 marks in Part–A and 12 marks in Part – B.

PART – A (8 x 4 = 32 Marks)
(Short Answer Type)

1 Apply Picard's method to solve initial value problem upto third approximation $y'=2y-2x^2-3$, given that y = 2 when x = 0.

2 Solve yp = 2yx + log q.

3 Solve xr = p where p, r, are first and second partial derivatives with respect to x.

4 Classify the equation $\frac{\partial^2 u}{\partial x^2}+4\frac{\partial^2 u}{\partial x\partial y}+4\frac{\partial^2 u}{\partial y^2}-\frac{\partial u}{\partial x}+2\frac{\partial u}{\partial y}=0.$

5 Solve $\frac{d^2 y}{\partial x^2}-y=x$, using power series method.

6 Solve $\frac{\partial u}{\partial x}=\frac{\partial u}{\partial y}$ with $u(x, 0) = 4e^{-x}$ using separation of variable method.

7 More that $(n+1)L_{n+1}(x) = (2n + 1 - x)L_n(x) - nL_{n-1}(x)$.

8 Show that $H_{2n+1}(0) = 0$.

PART – B (4 x 12 = 48 Marks)
(Essay Answer Type)

9 (a) Prove that all eigen values of Strum-Liouville's problem are real.

OR

(b) Explain Charpit's method for p, q from f(x, y, z, p, q)=0 and hence find the soluti
$2xz - px^2 - 2qxy + pq = 0$.

10 (a) Reduce $\frac{\partial^2 z}{\partial x^2}=x^2\frac{\partial^2 z}{\partial y^2}$ to a canonical form and hence solve it.

OR

(b) Solve $\frac{\partial u}{\partial t}=C^2\frac{\partial^2 u}{\partial x^2}$ subject to the following condition

(i) u(0, t) = 0 (ii) $\frac{\partial u}{\partial t}=0$ for $x=\ell$ (iii) $u(x, 0)=u_o\frac{x}{\ell}$ for $0 \le x \le .1$

11 (a) Solve by Frobenius method
$x^2 y'' + 2x^2y' - 2y = 0$

OR

(b) State and prove orthogonal properties of Legendre's polynomials.

12 (a) State and prove orthogonal properties of Hermite polynomials.

OR

(b) Prove that $\int_0^\infty e^{-x}L_n(x)L_m(x)dx \begin{matrix} =0\,;\, if & m\neq n \\ =1\,;\, if & m=n\end{matrix}$

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