Roll No. | | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 07

M.Sc Mathematics (2017 Batch) (Sem.–1)

ORDINARY DIFFERENTIAL EQUATIONS AND SPECIAL FUNCTIONS

Subject Code : MSM-104

Paper ID : [74723]

Time : 3 Hrs. Max. Marks : 80

INSTRUCTION TO CANDIDATES :

1. SECTION-A is COMPULSORY consisting of EIGHT questions carrying TWO marks each.
2. SECTION - B & C. have THREE questions in each section carrying SIXTEEN marks each.
3. Select atleast TWO questions from SECTION - B & C EACH.

SECTION-A

1. Answer briefly :

a. When is a singular point said to be regular?

b. State Bessel's function of order n.

c. Show that $\int_{-1}^{1} x\, P_n(x)\, P_{n-1}(x)\, dx = \frac{2x}{4n^2 - 1}$.

d. Give the generating function for Laguerre's Polynomial.

e. Formulate the differential equation of all circles of radius a.

f. Find general solution of $(2xy + x^2)y' = 3y^2 + 2xy$.

g. Define the Ber and Bei functions.

h. State Picard's fundamental existence and uniqueness theorem.

SECTION-B

2. State and prove sturm's separation theorem.

3. Solve $x^2\left(\frac{dy}{dx}\right)^2 + xy\frac{dy}{dx} - 6y^2 = 0$

4. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials.

SECTION-C

5. a) Solve in series $xy'' + 2y' + xy = 0$

   b) Express $f(x) = x^4+3x^3-x^2+5x-2$ in terms of Legendre Polynomials.

6. Prove that $(2n + 1)(1 + x^2) P_n'(x) = n(n + 1)[P_{n+1}(x) - P_{n+1}(x)]$

7. Define Hermite Polynomials. Hence establish the expression for the generating polynomial.