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Registration No : | | | | | | | | | | |

Total Number of Pages : 01 **M.Sc.I**

FMCC703

7th Semester Regular Examination 2019-20
ADVANCED DIFFERENTIAL EQUATION
BRANCH : M.Sc.I(MC)
Time : 3 Hours
Max Marks : 70
Q.CODE : HR243
Answer Question No.1 which is compulsory and any FIVE from the rest.
The figures in the right hand margin indicate marks.

Q1 **Answer the following questions :** **(2 x 10)**

a) What is homogeneous linear differential equation?
b) Derive $P_n(-1) = (-1)^n$
c) Derive $H_n(x)$ and for what values of n , $H_n(0) = 0$
d) Write the physical assumptions for two dimensional wave equation
e) Represent in terms of Hermite polynomial $f(x) = 1+x+x^2$
f) Write Green's function of the Dirchlet Problem for Laplace equation
g) Write D'Alembert's solution of one dimensional wave equation
h) What is Rectangular Membrane
i) Write the conditions to Test whether the differential equation is parabolic, Hyperbolic or Elliptic
j) What is Orthogonal Functions .

Q2 **a)** Derive Rodrigue's formula for Legendre Polynomials **(5)**
b) Solve $U_x + U_y = (x+y)U$ **(5)**

Q3 **a)** Prove that $\int P_n P_m = 0$ from -1 t0 1 when m not equal to n **(5)**
b) Derive one Dimensional Wave Equation **(5)**

Q4 **a)** Using the method of Frobenius to find solution of the differential equation $X(X-1)Y'' + (3X-1)Y' + Y = 0$ **(5)**
b) Solve $X^2Y'' + XY' + (X^2 - V^2)Y = 0$ **(5)**

Q5 **a)** Find the current in the simple circuit with $C=\infty$ and $E(t)=\sin wt$ **(5)**
b) Find the deflection U(x,y,t) of the squre membrane a=b=1 and c=1 if the initial velocity is zero and initial deflection is $10 \sin 3\pi x . \sin 4\pi y$ **(5)**

Q6 Derive D' Alembert's Solution of the Wave Equation **(10)**

Q7 Solve the Two Dimensional Wave Equation $U_{tt} = C2(U_{XX} + U_{YY})$ with boundary condition U=0 and $U(x,y,0) = f(x,y)$ and $U_t = g(x,y)$ at t=0 **(10)**

Q8 **Write short answer on any TWO :** **(5 x 2)**

a) Sturm Liouville Problems
b) Hermite Differential Equations and Hermite Polynomials
c) Derive Two Dimensional Wave Equation

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