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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, March 2013
(2008 Scheme)
(Machine Design)
MDM 1001 : ENGINEERING MATHEMATICS

Time : 3 Hours Max. Marks :100

Instruction : *Answer* ***any 5*** *questions.*

1. a) Prove that $\beta(n, n) = \dfrac{\sqrt{\pi}\,\lfloor n}{2^{2n-1}\,\lfloor (n + \frac{1}{2})}$.

   b) Prove that $\dfrac{d}{dx}[x\, J_n(x)\ J_{n+1}(x)]$

   $= x\left[J_n^2(x) - J_{n+1}^2(x) \right]$.

   c) Show that $\int_{-1}^{1} (1-x^2)\ P_m'(x) P_n'(x)\, dx = 0$.

2. a) Find the positive root of $x - \cos x = 0$ using bisection method.

   b) Solve the system of equations $x + y + 2z = 4$, $3x + y - 3z = -4$, $2x - 3y - 5z = -5$ using Gauss elimination method.

   c) Given $y' = x + y$, $y(0) = 1$, apply Runge-Kutta method to find $y(0.2)$.

3. a) Find $L^{-1}\left(\dfrac{S}{(S^2 + a^2)^2}\right)$.

   b) Using transforms evaluate $\int_0^{\infty} \dfrac{dx}{(x^2 + a^2)(x^2 + b^2)}$.

P.T.O.

4. a) Convert the differential equation

$y''(x) - 3y'(x) + 2y(x) = 5 \sin x$, $y(0) = 1$, $y'(0) = -2$ into an integral equation.

b) Apply the method of successive approximation to solve $f(x) = e^x - x \int_0^1 x(e^{xt} - 1)\ f(t)\ dt$.

5. a) Solve the partial differential equation $U_{xx} + U_{xy} - 2U_{yy} = 0$ by reducing to Cannonical form.

b) Derive the Laplace's equation in polar coordinates.

6. a) Discuss the transformation $W = \sin z$.

b) Find the image of the half plane $x > c$ where $c > o$ under the transformation $W = 1/z$.

c) Find the bilinear transformation which maps the points i, – 1, 1 of the z – plane into the points 0, 1, ∞ of the w – plane.