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Roll No

MVCT/MBCT/MVCP-101(Old)**M.E./M.Tech. I Semester**

Examination, December 2017

Advance Mathematics**Time : Three Hours****Maximum Marks : 70**

Note: i) Attempt any five questions out of eight.
 ii) All questions carry equal marks.

- Find the solution of the parabolic equation $u_{xx} = 2ut$, when $u(0,t) = u(4,t) = 0$ and $u(x,0) = x(4-x)$, taking $h = 1$ Find the values upto $t = 5$.
- Evaluate the partial values of the equation $u_{tt} = 16u_{xx}$ taking $Dx = 1$ upto $t = 1.25$. The boundary conditions are $u(0,t) = u(5,t) = 0$, $u_t(x,0) = 0$ and $u(x,0) = x^2(5-x)$.
- Find the Hankel transform of $\frac{e^{-ax}}{x}$ taking $x J_0(px)$ as the Kernel of the transform.
 - Find Mellin transform of $\sin x$.

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- Find Fourier sine transform of $f(n) = \frac{1}{x}$.
 - Find Fourier cosine transform of $f(x) = e^{-x}$.
- Show that the function $y = xe^x$ is a solution of the volterra integral equation

$$y(x) = \sin x + 2 \int_0^x \cos(x-t)y(t)dt$$
 - Form an integral equation corresponding to the differential equation $y'' + xy' + y = 0$ with the initial condition $y(0) = 1$; $y'(0) = 1$.
- Test for the extremum of the functional

$$I[y(x)] = \int_0^{\pi/2} (y'^2 - Q^2) dx; y(0) = 0; y(\pi/2) = 1$$
- Solve the boundary value problem
 $y'' - y + x = 0, (0 \leq x \leq 1), y(0) = 0, y(1) = 0$ by Rayleigh-Ritz method.
- Write a short note on the followings:
 - Green's function
 - Integro differential equation
 - Finite element method
 - Functional

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