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Reg. No. : .....

Name : .....

First Semester M.Tech. Degree Examination, June 2009
Branch – Civil (2008 Scheme)
Hydraulies Engineering and Geatechnical Engineering (Common)
CMA 1001 : APPLIED MATHEMATICS

Time: 3 Hours Max. Marks: 100

Instructions: *1) Answer **any five** questions.*
*2) **All** questions carry **equal** marks.*

I. a) Show that $\beta(m, n) - \int_0^\infty \frac{x^{n-1}}{(1+x)^{m+n}}dx = \int_0^1 \frac{x^{m-1}+x^{n-1}}{(1+x)^{m+n}}dx$

b) Prove that $e^{\frac{x}{2}\left(t-\frac{1}{t}\right)} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$.

II. a) Using Laplace transfotrm solve $t\,y'' + (t+1)y' + 2y = e^{-t}$, $y(0) = 0$.

b) Using Laplace transform solve $\frac{dy}{dt} + 2x = \sin 2t$, $\frac{dx}{dt} - zy = \cos 2t (t > 0)$.

If at t = 0, x = 1 and y = 0, show by transforms that the particle moves along the curve $4x^2 + 4xy + 5y^2 = 4$.

III. a) Using Fouries transform solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{dx^2}$ if $u_x(0, t) = 0$

$u(x, 0) = \begin{cases} x, & 0 \le x \le 1 \\ 0, & x > 1 \end{cases}$ and u(x, t) is bounded x > 0, t > 0.

b) Reduce into Canonical form $\frac{\partial^2 z}{\partial x^2} + \frac{\partial 2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = 0$.

P.T.O.

IV. a) Find the integral equation corresponding to the boundary value problem $y''(x) + \lambda y(x) = 0, y(0) = y(1) = 0$.

b) Using the method of successive approximation solve the valterra integral equation $y(x) = 1 + x + \int_0^x (x - t)y(t)dt$.

V. a) Derive the mean and variance of a binomial distribution.

b) A product is 0.5% defective and is packed in cartons of 100. What percentage contains not more than 3 defectives.

VI. a) In a normal distribution 5% of the items are under 60 and 40% are between 60 and 65. Find the mean and SD of the distribution.

b) The following table gives the classification of 100 workers according to sex and nature of work. Test whether the nature of work is independent of the sex of the worker

	Stable	**Unstable**	**Total**
Males	40	20	60
Females	10	30	40
	50	**50**	**100**