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I^{st} Sem., Supplementary Exam. B.Tech.(Evening) February 2019

CMA 101, Applied Mathematics - I

Time: 3 Hours Max. Marks: 40

Note: Attempt any five questions and all questions carry equal marks.

(1) (a) Find the *inverse Laplace transforms* of

$$\frac{s-1}{s^2-6s+25}.$$

(b) Find the *Laplace transforms* of

$$\frac{1}{t}(\cos at-\cos bt).$$

(2) (a) Find the A^{-1} by *Gauss-Jordan* method

$$A=\begin{bmatrix}1 & 3 & 3\\ 1 & 4 & 3\\ 1 & 3 & 4\end{bmatrix}$$

(b) Test for consistency the following system and find solution, if it exists:

$$4x-2y+6z=8$$
$$x+y-3z=-1$$
$$15x-3y+9z=21.$$

(3) (a) Apply convolution theorem to evaluate

$$L^{-1}\left\{\frac{s}{(s^2+a^2)^2}\right\}$$

(b) Using *Laplace transforms*, find the solution of the initial value problems

$$\frac{d^2y}{dx^2}+y=3\cos 2x,\ \text{at}\ y=\frac{dy}{dx}=0,\ \text{where}\ x=0.$$

(4) (a) Evaluate by change the order of integration in the integral

$$\int_x^{\sqrt{2-x^2}}\frac{xdydx}{\sqrt{x^2+y^2}}.$$

(b) Evaluate

$$\int_0^1\int_0^{\sqrt{1-x^2}}\int_0^{\sqrt{1-x^2-y^2}}\frac{1}{\sqrt{1-x^2-y^2-z^2}}dzdydx.$$

(5) (a) Show that

$$\sin^{-1}x=x+\frac{1^2}{3!}x^3+\frac{1^23^3}{5!}x^5+\frac{1^23^25^2}{7!}x^7+....$$

Hence find the value of π.

(b) Find the length of curve $y^3=x^3$ from origin to the point $(1,1)$.

(6) (a) Find a series of cosines of multiple of x which will represent $x\sin x$ in the interval $(0,\pi)$.

(b) Find the Fourier series for the function $f(x)$ in the interval $(-\pi,\pi)$, where

$$f(x)=\begin{cases}\pi+x, & -\pi<x<0,\\ \pi-x, & 0<x<\pi.\end{cases}$$

(7) (a) Evaluate the integral

$$\int_0^1\frac{x^2}{1+x^3}dx$$

by using *Simpson's* 1/3*rd* rule.

(b) Find by *Newton-Raphson iterative method*, the real root of the equation $3x=\cos x+1$.

(8) (a) Use *Runge-Kutta* method of fourth order to solve the differential equation

$$\frac{dy}{dx}=x-y^2,$$

with $y(0)=1$ to find $x=0.2$ and $h=0.1$.

(b) Solve the equations:

$$20x+y-2z=17;$$
$$3x+20y-z=-18;$$
$$2x-3y+20z=25.$$

by *Gauss-Seidal iteration method.*