Exam Seat no. .....

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BE Semester–III (NOV 2013)

Mathematics –III (CC301A)

(DIFFERENTIAL EQUATION & INTEGRAL TRANSFORM)

Max Marks: 70

Duration: 3 hr.

Instruction: 1) Answer each section in separate Answer sheet.
2) Use of Scientific calculator is permitted.
3) All questions are **compulsory**.
4) Indicate **clearly**, the options you attempt along with its respective question number.
5) Use the last page of main supplementary for **rough work**.

Section I

Q.1 (i) Solve following differential equations: [5]
(a) $(x^2-y^2)dx=2xy\,dy$ (b) $(1+y^2)dx=(\tan^{-1}y-x)\,dy$

(ii) Find Laplace transform of (i) $f(t)=t\cos t$ (ii) $f(t)=e^{at}\cosh bt$ [5]

(iii) Solve partial differential equation $\frac{\partial^2 z}{\partial x^2} - 2\frac{\partial^2 z}{\partial x \partial y} = sinx\,cos2y$ [5]

OR

(iii) Solve differential equation $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{2x}sinx.$ [5]

Q.2 (i) Solve by the method of undetermined coefficient [5]
$\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = e^{x}sinx.$

(ii) Obtain the Fourier series for the function $f(x)=2x+1$, $-\pi<x<\pi$ [5]

OR

(i) Solve by the method of variation of parameter [5]
$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = \frac{e^{3x}}{x^2}$$

(ii) Find Z-transform of the function $f(k)=\cos \alpha k$. [5]

Q.3 (i) Using Convolution theorem, find $L^{-1}\left\{\frac{1}{s^2(s-1)}\right\}$. [5]

(ii) Solve Cauchy Euler differential equation [5]
$$x^2\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = x^3$$

OR

(i) Find the Fourier transform of $f(t)=\begin{cases} e^{-at} & for\ t>0,\quad a>0 \\ 0 & for\ t<0,\quad a>0 \end{cases}$ [5]

(ii) Form PDE from z=y+f(x+ln, y). [5]

Section II

Q.4 (i) Find the orthogonal trajectories of the family of rectangular hyperbolas $x^2-y^2=a^2$. [5]

(ii) Find Laplace transform of $f(t)=(1-e^{-t})/t$. [5]

(iii) Solve $y'' + 4y' + 3y = 4e^{-x}$ given that y=0, y'=2 when x=0. [5]

OR

(iii) If Z{f(k)}=F(z) then Prove that [5]

(i) Z{k f(k)}=-z(d/dz)F(z) (ii) $Z\{a^k\ f(k)\}$=-F(z/a)

Q.5 (i) Solve by Exactness method $x^2e^y dx + \frac{x^3e^y}{3} dy = 0$ [5]

(ii) Solve $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + 3y = 3x^2$. [5]

OR

(i) Define Laplace transform and write any two properties of it. [5]

(ii) Find the Fourier cosine and sine transform of $f(x)=e^{-ax}$, a>0. [5]

Q.6 (i) Solve by the general method $\frac{d^2y}{dx^2} + y = cosec\ x.$ [5]

(ii) Find the Fourier series of $f(x)=\begin{cases} x, & -\frac{\pi}{2} < x < -\frac{\pi}{2} \\ \pi - x, & \frac{\pi}{2} < x < \frac{3\pi}{2} \end{cases}$ [5]

OR

(i) Solve $xy^2p + x^2y\ q = -(x^2-y^2)z$ [5]

(ii) Solve (a) $L^{-1}\left[\frac{s+10}{s^2-s-2}\right]$ [5]

BEST OF LUCK