* J B - 3 1 9 6 *

JB-3196

Second Year B. Sc. (Sem. IV) (Computer Science) Examination

April/May – 2013

CCM - 401 CS : Differential Equations

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી. **Fillup strictly the details of ☛ signs on your answer book.** Name of the Examination : ☛ **S. Y. B. SC. (SEM. 4) (COMPUTER SCIENCE)** Name of the Subject : ☛ **CCM - 401 CS : DIFFERENTIAL EQUATIONS** ☛Subject Code No. : **3 1 9 6** ☛Section No. (1, 2,.....) : **Nil**	Seat No. : Student's Signature

(2) All questions are compulsory.

(3) Figures to the right indicate full marks.

1 Attempt any five : **10**

(i) Solve $\frac{d^2y}{dx^2}+\frac{dy}{dx}+y=0$.

(ii) Evaluate $L\{\cos 3t+\sin 6t\}$.

(iii) Find particular integral (PI) of $\left(D^3+D^2\right)y=\cos 2x$.

(iv) Apply first shifting theorem to find $L\left\{e^{2t}t^2\right\}$.

(v) Solve $x\frac{dy}{dx}+4y=x$.

(vi) Eliminate a and b from $z = ax + by + ab$ to form partial differential equation.

(vii) State second shifting theorem for laplace transform.

2 (a) Discuss the method of finding particular integral (PI) of $f(D)y = e^{ax}$. **5**

OR

(a) Solve $\left(D^3 + 2D^2 + 4D + 8\right)y = x^3$.

(b) Attempt any two : **10**

(i) Find the particular integral of $f(D)y = \sin ax$.

(ii) Solve $\frac{d^2y}{dx^2} + 4y = \sin 3x + e^x + x^2$

(iii) Solve $\frac{d^2y}{dx^2} + 3\frac{dy}{dx} + 2y = e^{2x}\sin x$.

(iv) Solve $\left(D^2 - 2D + 1\right)y = x^2 e^{3x}$.

3 (a) State and prove change of scale property for laplace transform. **5**

OR

(a) Evaluate $L\{\sin\sqrt{t}\}$

(b) Attempt any two

(i) Evaluate $L\{\sin^3 t.\cos^3 t\}$

(ii) Derive the laplace transform of *coshat*

(iii) Find $L\{F(t)\}$, where

$$F(t)=\begin{cases}(t-1)^2, & t>1\\ 0, & 0<t<1\end{cases}$$

(iv) Evaluate $L\{e^{3t}\sin^3 t\}$.

4 (a) Discuss Lagrange's method of solving partial differential equation of first order. **5**

OR

(a) Solve $(mz-ny)\frac{\partial z}{\partial x}+(nx-lz)\frac{\partial z}{\partial y}=ly-mx$ by using method of multiplier.

(b) Attempt any two : **10**

(i) Solve the equation :

$$\frac{\partial^3 z}{\partial x^3}-7\frac{\partial^3 z}{\partial x\partial y^2}-6\frac{\partial^3 z}{\partial y^3}=\sin(x+2y).$$

(ii) Form the partial differential equation from $(x-h)^2+(y-k)^2+z^2=c^2$ by eliminating h and k.

(iii) Solve $\frac{\partial^2 z}{\partial x \partial y} = \frac{y}{x} + 2$ by the method of direct integration.

(iv) Solve $\frac{y-z}{yz} p + \frac{z-x}{zx} q = \frac{x-y}{xy}$, where

$p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$.

5 (a) Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial^2 u}{\partial t^2}$ by using method of separation of variables. 5

OR

(a) Solve $x^3 \frac{d^3 y}{dx^3} + x \frac{dy}{dx} - y = 4x^3$

(b) Attempt any two : 10

(i) Discuss the lagrange method of solving the partial differential equation of the type $pP + qQ = R$, where

$p = \frac{\partial z}{\partial x}$ and $q = \frac{\partial z}{\partial y}$ and P, Q, R are functions of x, y and z.

(ii) Using definition find $L\{1 + \sin t\}$.

(iii) Solve $\frac{\partial^2 z}{\partial x^2} + 2\frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = e^{x+y}$

(iv) Solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ by using method of separation of variables.