AC-3102
Second Year B. Sc. (Comp. Sci.) (Sem. IV) Examination
April / May – 2015
CCM-401 CS : Differential Equations

Time : 3 Hours] [Total Marks : 70

Instructions :

(1) Fill up strictly the details of ☉ signs on your answer book.
Name of the Examination :
SECOND YEAR B. SC. (COMP. SCI.) (SEM. 4)
Name of the Subject :
CCM-401 CS : DIFFERENTIAL EQUATIONS
Subject Code No. : 3 1 0 2 ☉ Section No. (1, 2, ....) ☉ Nil
Seat No. :

(2) All questions are compulsory.
(3) Figures to the right indicate full marks.
(4) Symbols have their usual meaning.

1 Attempt the following questions as directed : 10

(1) Find CF of \( (D^2 - D - 1)y = \cos 2x \).

(2) Evaluate \( L \{ e^{-3t} \cdot \sin t \} \)

(3) Eliminate \( a \) and \( b \) from \( Z = ax + by + ab \) to get partial differential equation.

(4) Find PI of \( (D^3 - 1)y = e^x \)

(5) Solve \( \frac{\partial^2 z}{\partial x \partial y} = xy + \sin y \).

[ Contd......]
2 (a) Discuss the method of finding PI of \( f(D)y = xV \), where \( V \) is a function of \( x \).

OR

(a) Solve : \( (D^2 - 1)y = (1 + x^2)e^x \).
(b) Solve any two :

(1) \( (D^2 - 1)y = x^2 \cos x \)

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

(3) \( x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + y = 2 \log x \)

(4) \( x^2 \frac{d^2y}{dx^2} + 2x \frac{dy}{dx} - 12y = (x+1)^2 \)

3 (a) Discuss Lagrange Method of solving partial differential equation of first order.

OR

(a) Solve : \( x (y^n - z^n) p + y (z^n - x^n) q = z (x^n - y^n) \)
(b) Solve any two :

(1) From the partial differential equation from \( (x-h)^2 + (y-k)^2 + z^2 = C^2 \) by eliminating \( h \) and \( k \).

(2) \( x^2 (y-z) + y^2 (z-x) q = z^2 (x-y) \)

(3) \( (D+1)(D+D'-1)z = \sin(x+2y) \)

(4) \( p + q = \frac{z}{a} \)

AC-3102] 2 [ Contd......
4  (a) State and prove linearity property of Laplace Transform.

OR

(a) Derive Laplace Transform of $t^n$.

(b) Solve any two:

1. Find the Laplace transform of the function $F(t)$, where

$$F(t) = \begin{cases} 
2t, & 0 \leq t \leq 5 \\
1, & t > 5 
\end{cases}$$

2. Evaluate $L\left\{e^{4t} \sin^4 t\right\}$

3. Find $L\left\{F(t)\right\}$, where $F(t) = \begin{cases} 
\sin\left(t - \frac{\pi}{3}\right), & t > \frac{\pi}{3} \\
0, & t < \frac{\pi}{3} 
\end{cases}$

4. Derive Laplace transform of $e^{at}$.

5  (a) State one dimensional heat equation and solve by the method of separation of variable.

OR

(a) Use method of separation of variable to solve

$$\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u, \quad u(x, 0) = 6e^{-3x}.$$
(b) Solve any two:

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

(2) Solve \( \frac{y-z}{yz} p + \frac{z-x}{zx} q = \frac{x-y}{xy} \), where symbols have their usual meaning.

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

(4) Find \( L\{\cos(at)\} \) using definition.