END SEMESTER EXAMINATION:
APRIL - MAY, 2015

APPLIED MATHEMATICS - II

Time: 3 Hrs
Maximum Marks: 70

Note: Attempt questions from all sections as directed.

SECTION A (30 Marks)

Attempt any five questions out of six.
Each question carries 06 marks.

1. Find the solution of
   \((3x^2 + y \cos x)dx + (\sin x - 4y^3)dy = 0\).

2. Solve: \(\frac{dy}{dx} + \frac{1}{3}y = e^y y^4\).

3. Form the partial differential equation from
   \(ax^2 + by^2 + z^2 = 1\), where \(a\) and \(b\) are constants.

4. Solve: \(\frac{\partial^2 z}{\partial x^2} + 2 \frac{\partial^2 z}{\partial x \partial y} + \frac{\partial^2 z}{\partial y^2} = \sin (2x + 3y)\).

5. Use Cauchy's integral formula to evaluate
   \[\int_C \frac{z}{(z^2 - 2z + 2)} \, dz\],
   where \(C\) is the circle \(|z - 2| = \frac{1}{2}\).

P.T.O.
6. Expand \( f(z) = \frac{z}{(z-1)(2-z)} \) in series valid for 
\( 0 < |z - 2| < 1 \).

**SECTION – B**  
(20 Marks)  
Attempt any two questions out of three.  
Each question carries 10 marks.

7. Solve: \((D^3 + 2D^2 + D)y = x^2e^{2x} + \sin 2x\).

8. Solve by Charpit’s method: \((p^2 + q^2)y = qz\).

9. Evaluate the residues of \( \frac{z^2}{(z-1)(z-2)(z-3)} \) at \( z = 1, 2, 3 \) and infinity and find their sum.

**SECTION – C**  
(20 Marks)  
(Compulsory)

10. (a) Solve the following simultaneous differential equation.
\[
\frac{dx}{dt} + 2x + 3y = 0, \quad 3x + \frac{dy}{dt} + 2y = 2e^{3t}
\]

(b) Show that the function \( f(z) \) defined by
\[
f(z) = \frac{xy^3(x + iy)}{x^2 + y^6}, \quad z \neq 0; \quad f(0) = 0
\]
is not analytic at the origin even though it satisfies Cauchy-Riemann equations at the origin.

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