

SE comp

SE IT III

Applied Mathematics - III 31 May 2014

(CBGS)

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QP Code : NP-18619

(3 Hours)

[ Total Marks : 80

- N.B. : (1) Question No.1 is compulsory.  
(2) Attempt any three questions from Question No.2 to Question No.6.  
(3) Non-programmable calculator is allowed.

1. (a) Find  $L^{-1}\left[\frac{Se^{-\pi s}}{S^2 + 2S + 2}\right]$  5

(b) State true or false with proper justification "There does not exist an analytic function whose real part is  $x^3 - 3x^2y - y^3$ ". 5

(c) Prove that  $f_1(x) = 1$ ,  $f_2(x) = x$ ,  $f_3(x) = \frac{(3x^2 - 1)}{2}$  are orthogonal over  $(-1, 1)$ . 5

(d) Using Green's theorem in the plane, evaluate  $\int_C (x^2 - y)dx + (2y^2 + x)dy$  around the boundary of the region defined by  $y = x^2$  and  $y = 4$ . 5

2. (a) Find the fourier cosine integral representation of the function  $f(x) = e^{-ax}$ ,  $x > 0$  6

and hence show that  $\int_0^{\infty} \frac{\cos ws}{1+w^2} dw = \frac{\pi}{2} e^{-x}$ ,  $x \geq 0$ .

(b) Verify laplaces equation for  $U = \left(r + \frac{a^2}{r}\right) \cos \theta$  Also find V and  $f(z)$ . 6

(c) Solve the following eqn. by using laplace transform.  $\frac{dy}{dt} + 2y + \int_0^t y dt = \sin t$  given that  $y(0) = 1$ . 8