

SECCM (III) choice based)  
8th May 2019

Q. P. Code: 21237

Time: 3 Hours

Marks: 80

Note : 1) Q.1 is COMPULSORY.

2) Attempt ANY 3 questions from Q.2 to Q.6

3) Use of scientific calculators allowed.

4) Figures to right indicate marks.

Q.1 a) Find the Laplace transform of  $t e^t \sin 2t \cos t$ . (05)b) Find the inverse Laplace transform of  $\frac{s+2}{s^2(s+3)}$  (05)c) Determine whether the function  $f(z) = x^2 - y^2 + 2ixy$  is analytic and if so find its derivative. (05)d) Find the Fourier series for  $f(x) = e^{-|x|}$  in the interval  $(-\pi, \pi)$ . (05)Q.2 a) Evaluate  $\int_0^{\infty} \frac{e^{-t} - \cos t}{te^{4t}} dt$  (06)b) Find the Z- Transform of  $f(k) = \begin{cases} 3^k, & k < 0 \\ 2^k, & k \geq 0 \end{cases}$  (06)c) Show that the function  $u = 2x(1-y)$  is a harmonic function. Find its harmonic conjugate and corresponding analytic function. (08)

Q.3 a) Find the equation of the line of regression of y on x for the following data (06)

X	10	12	13	16	17	20	25
y	19	22	24	27	29	33	37

b) Find the bilinear transformation which maps  $z = 2, 1, 0$  onto  $w = 1, 0, i$ . (06)c) Obtain the expansion of  $f(x) = x(\pi - x)$ ,  $0 < x < \pi$  as a half range cosine series.Hence show that  $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} = \frac{\pi^2}{12}$ . (08)

Q.4 a) Find the inverse Laplace Transform by using convolution theorem

 $\frac{1}{(s^2+1)(s^2+9)}$  (06)

b) Calculate the coefficient of correlation between Price and Demand. (06)

Price : 2, 3, 4, 7, 4.

Demand : 8, 7, 3, 1, 1.

