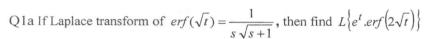
Paper / Subject Code: 50901 / Applied Mat O. P. Code: 24408 S.E. SEM - III / COMPU / CHOICE BASED / NOV 2018 / 20.11.2018/APPLIED MATHS-III

Time: 3 hrs

Marks: 80

NB 1. Question No.I is compulsory

- 2. Attempt any three from the remaining six questions
- 3. Figures to the right indicate full marks





[6]

[8]

b Find the Orthogonal Trajectory of the family of curves given by $e^{-x} \cdot \cos y + x \cdot y = c$

- c Find Complex Form of Fourier Series for e^{2x} ; 0 < x < 2
- d. If the two regression equations are 5x 6y + 90 = 0, 15x 8y 180 = 0,

find the means of x and y, the Correlation Coefficient and Standard deviation of x if variance of Y is 1

Q2 Show that the function is Harmonic and find the Harmonic Conjugate
$$v = e^x \cdot \cos y + x^3 - 3xy^2$$

b Find Laplace Transform of
$$f(t) = \begin{cases} t & ; 0 < t < 1 \\ 0 & ; 1 < t < 2 \end{cases}$$
, $f(t+2) = f(t)$ [6]

c. Find Fourier Series expansion of
$$f(x) = x - x^2, -1 < x < 1$$

Q3 a Find the Analytic function
$$f(z) = u + iv$$
 if $v = \log(x^2 + y^2) + x - 2y$ [6]

b Find Inverse Z transform of
$$\frac{3z^2 - 18z + 26}{(z-2)(z-3)(z-4)}, 3 < |z| < 4$$

c Solve the Differential Equation
$$\frac{d^2y}{dt^2} + 4y = f(t), f(t) = H(t-2), y(0) = 0, y'(0) = 1$$
 using Laplace Transform [8]

Q4 a Find
$$Z\{f(k) * g(k)\}\$$
if $f(k) = \left(\frac{1}{2}\right)^k, g(k) = \cos \pi k$

b Find the Spearman's Rank correlation coefficient between X and Y.

- 1		1
- 1	n	

[6]

X	60	30	37	30	42	37	55	45
Y	50	25	33	27	40	33	50	42

c Find the inverse Laplace transform of i)
$$\frac{3s+1}{(s+1)^4}$$
 ii) $\frac{e^{4-3s}}{(s+4)^{5/2}}$

[8]

[6]

Q5 a Find Inverse Laplace Transform using Convolution theorem
$$\frac{1}{(s-4)^2(s+3)}$$
 [6]

b Show that the functions $f_1(x) = 1$, $f_2(x) = x$ are Orthogonal on (-1,1). Determine the constants a, b such that the function $f(x) = -1 + ax + bx^2$ is Orthogonal to both $f_1(x)$, $f_2(x)$ on the (-1,1)

c Find the Laplace transform of i)
$$e^{-3t} \int_0^t t \sin 4t \, dt$$
 ii) $\int_0^\infty \frac{e^{-t} - e^{-2t}}{t} dt$ [8]

Q6 a Fit a second degree parabola to the given data

X	1	1.5	2	2.5	3	3.5	4
Y	1.1	1.3	1.6	2	2.7	3.4	4.1

bFind the image of $\left|z - \frac{5}{2}\right| = \frac{1}{2}$ under the transformation $w = \frac{3-z}{z-2}$ [6]

c Find Half Range Cosine Series for $f(x) = x \sin x$ in $(0,\pi)$ and hence find $\frac{1}{1.3} - \frac{1}{3.5} + \frac{1}{5.7} - \dots = \frac{\pi - 2}{4}$ [8]
