C.U.SHAH UNIVERSITY

Summer Examination-2017

Subject Name: Engineering Mathematics-III

Subject Code: 4TE03EMT1 Branch: B.Tech (All)

Semester: 3 Date: 21/03/2017 Time: 10:30 To 01:30 Marks: 70

Instructions:

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
- (2) Instructions written on main answer book are strictly to be obeyed.
- (3) Draw neat diagrams and figures (if necessary) at right places.
- (4) Assume suitable data if needed.

Q-1 Attempt the following questions: (14)

- a) State Dirichlet's conditions for Fourier series. (02)
- b) State and prove first shifting theorem. (02)
- c) Find: $L(5-\sin^2 2t \cos^2 2t)$ (02)
- **d**) Solve: $(D^3 + D)y = 0$ (02)
- **e)** Find: $L(t^3e^{3t})$ (02)
- f) Eliminate the arbitrary function from the equation z = xy + f(x + y) (02)
- g) Derive the iterative formula for finding the reciprocal of positive number N by Newton-Raphson method. (02)

Attempt any four questions from Q-2 to Q-8

Q-2 Attempt all questions

a) Obtain the constant term and the co-efficient of the second sine and cosine terms in the Fourier expansion of y as given in the following table:

(14)

х	0	$\frac{\pi}{3}$	$\frac{2\pi}{3}$	π	$\frac{4\pi}{3}$	$\frac{5\pi}{3}$	2π
у	1	1.4	1.9	1.7	1.5	1.2	1

b) Solve the differential equation $(y'' + 3y' + 2y) = e^t$; y(0) = 1, y'(0) = 0 by using Laplace Transformation. (07)

Q-3 Attempt all questions (14)



- a) Obtain Fourier series of $f(x) = x^2$ in $(-\pi, \pi)$ and hence deduce that $\frac{1}{1^2} \frac{1}{2^2} + \frac{1}{3^2} \frac{1}{4^2} + \dots = \frac{\pi^2}{12}.$
- **b)** Find the Fourier series of $f(x) = \begin{cases} x & -1 < x < 0 \\ x+2 & 0 < x < 1 \end{cases}$ (05)
- c) Find the half range sine series of $f(x) = \begin{cases} x & 0 < x < \frac{\pi}{2} \\ \pi x & \frac{\pi}{2} < x < \pi \end{cases}$ (04)
- Q-4 Attempt all questions (14)
 - a) Find Laplace Transformation of $\sin 2t$ and t^n by using the definition of it. (05)
 - **b)** Evaluate: $L(te^{-2t}\sin^2 t)$ (05)
 - c) State Convolution Theorem and using it find $L^{-1}\left(\frac{1}{(s-2)(s+2)^2}\right)$. (04)
- Q-5 Attempt all questions (14)
 - a) Solve the differential equation $(D^2 + 2D + 1)y = e^{-x} \log x$ by the method of variation of parameter. (05)
 - **b)** Solve: $(D^4 1)y = e^x \cos x$ (05)
 - c) Solve: $(D^2 4D + 4)y = e^{2x} + \cos 2x + x^3$ (04)
- Q-6 Attempt all questions (14)
 - a) Obtain a formula for qth root of a positive integer N and find the value of $\sqrt{28}$ by Newton-Raphson method up to four significant digits. (05)
 - **b)** Find the root of the equation $x^3 2x + 5 = 0$ by bisection method up to three decimal places. (05)
 - c) Find the roots of equation $\cos x xe^x = 0$ by using secant method correct up to four decimal places. (04)
- Q-7 Attempt all questions (14)
 - a) Solve the differential equation $\frac{\partial u}{\partial x} = 2 \frac{\partial u}{\partial t} + u$; $u(x,0) = 6e^{-3x}$ by the method of separation of variables. (05)
 - **b)** Solve: $\frac{\partial^2 z}{\partial x \partial y} = \sin x \cos y$, given that $\frac{\partial z}{\partial y} = -2\cos y$ when x = 0 and z = 0 when y is a multiple of π .
 - c) Find the general solution of the differential equation (y+z)p+(z+x)q=(x+y). (04)



a) Solve:
$$(x^2D^2 + xD)y = \frac{12\log x}{x^2}$$
 (05)

b) Find:
$$L^{-1}\left(\frac{4s+5}{(s-1)^2(s+2)}\right)$$
 (05)

c) Form the partial differential equation
$$f(x^2 + y^2 + z^2, xyz) = 0$$
. (04)

