

Enrollment No: _____ Exam Seat No: _____

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: $L(t^3 e^{3t})$ (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** (14)
- 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: (07)
- | | | | | | | | |
|-----|---|-----------------|------------------|-------|------------------|------------------|--------|
| x | 0 | $\frac{\pi}{3}$ | $\frac{2\pi}{3}$ | π | $\frac{4\pi}{3}$ | $\frac{5\pi}{3}$ | 2π |
| y | 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 (05)

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}.$$

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 $\sqrt[4]{28}$ 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 . (05)

c) Find the general solution of the differential equation $(y+z)p + (z+x)q = (x+y)$. (04)



Q-8 Attempt all questions

(14)

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

(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)

