ID.No./Seat No. 10EL131

MEHRAN UNIVERSITY OF ENGINEERING AND TECHNOLOGY,
JAMSHORO.

FIRST TERM SECOND YEAR (3^{RD} TERM) B.E.(EL, ES, TL, BM, CS, SW, CH, PG & MN) REGULAR EXAMINATION 2011 OF 10-BATCH

DIFFERENTIAL EQUATIONS AND FOURIER SERIES

Dated: 26-05-2011 Time Allowed: 03 Hours. Max:Marks-80.

NOTE: ATTEMPT ANY **FIVE** QUESTIONS.

Q.No.

01: (a) Find the differential equation by eliminating arbitrary constants from $Y = x^2 + C_1 x + C_2 e^{-x}$

(b) Find the orthogonal trajectories for the family of the curve, $x = \frac{y^2}{4} + \frac{c}{y^2}$

(c) Solve the differential equation $\sin^{-1} Y' = (x + y + 1)$ OR The population of certain town is increasing at the rate of present population. If population doubles in 10 years. How long will it take to be tripled ?

02: Solve the following differential equations

(i) $y' + \frac{(x - 2y)}{(2x - y)} = 0$

(ii) $(2x + y + 1)\,dx + (4x + 2y - 1)\,dy = 0$

(iii) $y \log y\,dx + (x - \log y)\,dy = 0$

03: (a) Define integrating factor. Solve the following differential equation by finding appropriate (I.F.)
$(y + xy^2)\,dx + (x - x^2 y)\,dy = 0$

(b) Solve the Exact differential equation, $(\sin x \cos y + e^{2x})\,dx + (\cos x \sin y + \tan y)\,dy = 0$

(c) Solve the equation, $x + y p^2 = p(1 + xy)$ for p

04: Find only particular solution of each of the following differential equations.

(i) $(D^2 + 4)\,y = x \sin^2 x$

(ii) $(D^2 + 1)\,y = \sin 3x - \cos^2\left(\frac{x}{2}\right)$

(iii) $(D^2 - 6D + 11)\,y = 4e^{3x} \sin 4x + e^{x \log 2}$

05: (a) Solve the differential equation, $x^2 Y'' + 3x Y' + Y = (x - 1)^{-2}$

(b) Solve the following partial differential equations by the method of separable variables.

(i) $4\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} = 3u$ if $u = e^{-5y}$ when $x = 0$.

(ii) $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ if $u(x,0) = \sin \pi x$

$e^{x\log 2}$

Cont'd on P/-2…

06: (a) By the method of variation of parameters, find a solution of $Y'' + Y = \sec x$

(b) Determine the Fourier coefficients of the Fourier series , if f(x) is periodic.

07: (a) Expand the following functions in a Fourier series

(i) $f(x) = \cos 2x$ interval $-\pi<x<\pi$

(ii) $f(x) = x^2$ interval $-\pi<x<\pi$ and show that $\sum \frac{1}{n^2} = \frac{\pi^2}{6}$

(b) Find the half rang Sin series represent the function $f(x) = e^x$ interval $0 < x < \pi$

08: (a) Find the Fourier series $f(x) = 1 - x^2$ $-1 < x < 1$

Change the arbitrary period $f(x) = f(x+2)$ that is transformed to the function of period 2π

(b) Determine whether the following given series converges or diverges

(i) $\sum_{n=1}^{\infty} \frac{n^n}{n!}$

(ii) $\sum_{n=1}^{\infty} \frac{(n!)^2}{(2n)!}$

(iii) $\sum_{n=1}^{\infty} \frac{\arctan n}{1+n^2}$

---------------------THE END--------------------