Kafrelsheikh University

Faculty of Engineering

Physics & Engineering Mathematics Dept.

Year: Second Year-Elec.   Subject: Engineering Mathematics (3) [PHM2009]

Date: 30/5/2019

Time allowed: 3 hours

Full mark: 90

Final-Term Exam: 1 page

Question 1: [30 marks] [ILOs: a1,b7,c1,c7]

a) The population of Mississippi during five census periods was as follows:

Year (x)	1891	1901	1911	1921	1931
Population (y) "in thousand"	46	66	81	93	101

Interpolate the population during 1925 by using Newton's interpolation.

b) Use Runge-Kutta method to obtain the approximate value y(0.1) where y(x) is a solution of second O.D.E.

$$y'' + 3xy' - 6y = 0, \quad \text{with initial condition } y(0) = 1, \ y'(0) = 0.1$$

c) Calculate ln(2) by using Lagrange interpolation, where ln(1)=0, ln(4)=1.386294, ln(6)=1.791759

Question 2: [30 marks] [ILOs: a1,b1,b7]

a) Fit the curve $y = ax^b e^{cx}$ to the following readings

x	1	2	3	4
y	3.6	5.2	6.8	8.8

b) By using Bisection method, find root of $3x - e^{-x} = 0$ in the interval [0.25,0.27] (correct to three decimal places).

c) By using eigenvalues and eigenvectors, find the solution of:

$$X' = \begin{bmatrix} 0 & 1 \\ -4 & 0 \end{bmatrix} X, \qquad X(0) = \begin{bmatrix} 5 \\ 3 \end{bmatrix}$$

Question 3: [30 marks] [ILOs: a1,b1]

a) Use LU-Decomposition to find the inverse of $A = \begin{pmatrix} 25 & 5 & 1 \\ 64 & 8 & 1 \\ 144 & 12 & 1 \end{pmatrix}$

b) Prove that $\beta(m,n) = \dfrac{\Gamma(m)\Gamma(n)}{\Gamma(m+n)}$

By using Gamma and Beta Functions, Find the following:

c) The area between $y = 4x^{3/2} e^{-x^2/2}$, $x = 0$

d) $(i) \displaystyle\int_0^\infty \sqrt{y}\, e^{-y^3} dy$ $(ii) \displaystyle\int_0^{\frac{\pi}{2}} \sin^6(\theta)d\theta$ $(iii) \displaystyle\int_0^2 \frac{x^2}{\sqrt{2-x}} dx$

With my best wishes >>>>=================<<<< *Dr. Manal Elsayed*

Manal