University of Technology
Department of Applied Sciences
Final Examination
2016 -2015

Subject : Numerical Analysis | *Class : second class*
Branch : Appl-Math | *Time : 3 hours*
Examiner: A.M Shukur | *Date : / 5 /2016*

Note: Answer only five questions, (14 mark for each one)

Q1) Use Gauss-Sidle method to calculate the approximation-solution(X^3) and the absolute Error, of the following system;($x_1+6x_2-3x_3=4$); ($5x_1+2x_2-x_3=6$) ($2x_1+x_2+4x_3=7$) ? Start with $X^0 = 0$; where exact solution is $X = (1, 1, 1)^T$.

Q2) For the following data, x ={0.1, 0.5, 0.9, 0.3, 1.7}, and f(x) = sin(x); use Newton's differences method to find the approximation values for sin(1.5) and sin (0.3)? Calculate the absolute error for each one?

Q3) By using least square method find the best polynomial f(x) = a e^{bx} to fit the following data (1 ,2) ; (2 , 3) ; (3 , 4) ?

Q4) Use Taylor's series method (m = 4) to solve IVP $y' = y$ and y(0) = 1? Write the error-term in this method?

Q5) Use composition between (3/8 Simpson and Trapezoidal) rules, to calculate the area under the curve $f(x) = e^{x^2}$; from x = 0 to x = 1.2 ; where h = 0.3 ? write the traction errors term for both formulas?

Q6) Prove that one can Write the linear system (AX = b) in the general form ($\vec{X}^{k+1} = M^*\vec{X}^k + \vec{Y}_*$) by using iteration (Jacobi and SOR) methods? where the matrix M^* is M_{Jacobi} or M_{sor} also the vector $\vec{Y}_*$ is $\vec{Y}_{Jacobi}$ or $\vec{Y}_{SOR}$.

Good Luck

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Department of Applied Sciences
Final Examination 2015/2016

Subject : Ordinary D.E. ***year:2-nd year***
Division :Applied Mathematics ***Time : 3 hours***
Examiner : Assist.Prof.Ikram A.Saed ***Date :***

Answer five Questions only

Q1:Solve the following D.E. :

(a) $[\, x \sin(\frac{y}{x}) - y \cos(\frac{y}{x})\,]\, dx + x \cos(\frac{y}{x})\, dy = 0$ (7 marks)

(b) $e^{2y}\, dx + 2(xe^{2y} - y)dy = 0$ (7 marks)

Q2: (a) Find the orthogonal trajectories of the following family of curves :

$y = (\, x - c\,)^2$. (c is a parameter) (7 marks)

(b) Prove that :

$x\, J'_p(x) = p\, J_p(x) - x\, J_{p+1}(x)$ (7 marks)

Q3: (a) Find the general solution of the following D. E. :

$y''' - y' = 4e^{-x} + 3e^{2x}$. (9 marks)

(b) Given $L\{f(x)\} = F(s)$, show that $L\{f'(x)\} = s\,F(s) - f(0)$. (5 marks)

Q4:(a)Use the power – series method to find the general solution near $x_0 = 2$ of the following D . E. :

$y'' - (x-2)y' + 2y = 0$ (9 marks)

(b)Show that $y = x^2 J_2(x)$ is a solution of the D.E. :

$xy'' - 3y' + xy = 0$. (5 marks)

Q5:(a)Solve the following D. E. by using Laplace transform .

$y'' - 3y' + 4y = 0$, $y(0) = 1$, $y'(0) = 5$ (7 marks)

(b)Expand $f(x) = \cos x$, $0 < x < \pi$ in a Fourier sine series . (7 marks)

Q6:(a)Find $L^{-1}\left\{ \frac{2s}{s^2 - 6s + 10} \right\}$. (7 marks)

(b)Find $L\,\{e^{-x}\, x \cosh 2x\}$. (7 marks)