KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY
Department of Mechanical Engineering
B. Sc. Engineering 3rd year 1st Term Examination, 2017
ME 3121 (Backlog)
(Numerical Method)

Time: 3 Hours. Total Marks: 210

N.B. i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION - A

1(a) Starting from Newton's general interpolation formula, derive the Lagrange's formula for interpolation. 18

1(b) Determine the value of y when $x = 7.12$ and the value of x, when $y = 56.38$ from the table by Lagrange's interpolation formula. 17

x	6.67	6.98	7.23	7.96
y	50.01	55.50	59.10	62.30

2(a) Deriving general integration formula formulate Simpson's ⅓ formula. 18

2(b) From the following table of values of x and $y = e^x$, interpolate the value of y when $x = 1.91$ using Stirling's formula. 17

x	1.7	1.8	1.9	2.0	2.1	2.2
$y = e^x$	5.4739	6.0496	6.6859	7.3891	8.1662	9.0250

3(a) Describe the method of False position for the solution of non-linear equation. 10

3(b) Use Newton-Raphson method to obtain a root, correct to four decimal places of the equation $x - \cos x = 0$. 15

3(c) Describe the method of iteration for system of non-linear equations. 10

4(a) What are the methods for the solution of linear algebraic equation? Describe Jacobi method for the solution of these equations. 17

4(b) Solve the following system of equations by Gaussian elimination method. 18

$$2x + y + z = 10$$
$$3x + 2y + 3z = 18$$
$$x + 4y + 9z = 16$$

SECTION – B

5(a) Deduce Euler's formula for the solution of ordinary differential equation also write down its modified form. 17

5(b) Solve the following equation $\frac{dy}{dx} = 2y + 3e^x$ with $y(0) = 0$, using Taylors's series method at $x = 0.1$ correct up to three decimal places. 18

6(a) Use the Runge-Kutta Forth-order method to find the value of y when $x = 0.6$ taking h = 0.2. $dy/dx = \frac{y-x}{y+x}$ 20

6(b) Fit an exponential function of the type $y = ae^{bx}$ to the following data by Least square method. 15

x	0	0.5	1.0	1.5	2.0	2.5
y	0.10	0.45	2.15	9.15	40.35	180.75

7(a) What is partial differential equation? Classify partial differential equation. 06

7(b) Discretize the following partial differential quotients 08

$\frac{\partial T}{\partial x}$, $\frac{\partial^2 T}{\partial x^2}$, and $\frac{\partial^2 T}{\partial x \partial y}$

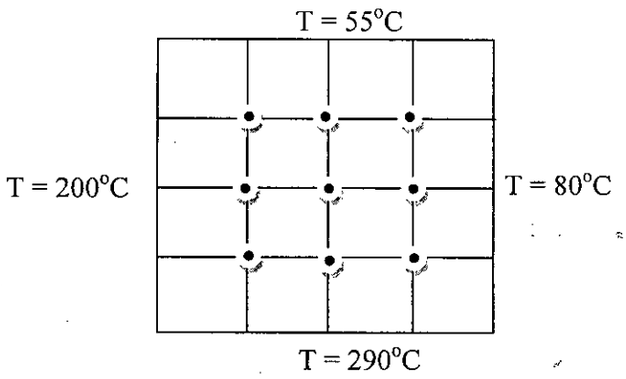
7(c) What are the steps in finite difference methods? 04

7(d) Solve the Laplace equation by finite difference method. 17

$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0.$

8(a) Describe the Crank-Nicolson method for the solution of unsteady parabolic equation. 16

8(b) Calculate the value of T at all interior nodal points within a square slab following the governing equation $\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} = 0$ and the given boundary conditions. 19



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