

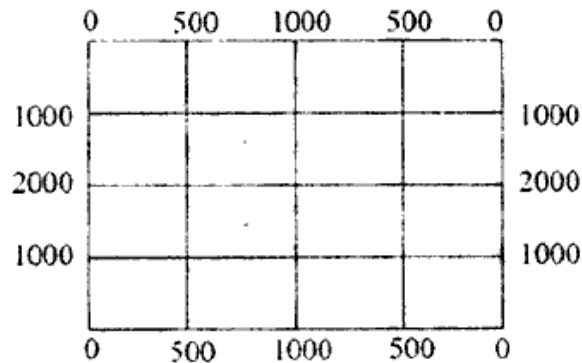
7. Using Runge-Kutta Method of order 4, find y for
 $x = 0.1, 0.2, 0.3$

Given that: $\frac{dy}{dx} = xy + y^2$, $y(0) = 1$.

Continue the solution at $x = 0.4$ using Adam's Method.

Section-D

8. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown



9. (a) Fit a parabola $y = a + bx + cx^2$ to the following data:

x	2	4	6	8	10
y	3.07	12.85	31.47	57.38	91.29

- (b) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions
 $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$; $u(0, t) = u(1, t) = 0$,
 using Crank Nicolson Method.

NUMERICAL METHODS AND COMPUTING TECHNIQUES

Paper-CE-309-F

Time allowed : 3 hours]

[Maximum marks : 100

Note : Question No. 1 is compulsory. Attempt total five questions with selecting one question from each section. All questions carry equal marks.

- Define the terms Interpolation and Extrapolation. $2\frac{1}{2} \times 8$
 - Define forward differences and backward differences.
 - What are direct methods and iterative method to solve the system of linear equations?
 - What are the limitations of Taylor's series method for solving ordinary differential equations?
 - State Trapezoidal Rule.
 - Write the finite difference approximations to partial derivatives in x and y directions.
 - Write Muller's method to solve non-linear equations.
 - How are the partial differential equations classified? Give an example for each type.

9. In a single block brake, the drum diameter is 300 mm and the contact angle is 90° , the coefficient of friction for the brake lining and drum is 0.30, if the operating force is 400 N, applied at the end of the lever 400 mm long, determine the torque transmitted by the brake. The distance of the fulcrum from the centre of the brake drum is 200 mm and assume that the force of friction passes through the fulcrum. 20

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B. Tech. 5th Semester (ME) F. Scheme Examination,
December-2017

MECHANICAL MACHINE DESIGN-I

Paper-ME-303-F

Time allowed : 4 hours]

[Maximum marks : 100

Note : Attempt any five questions in total, at least one question from each section. Question no. 1 is compulsory. Each question carries equal marks (20 marks). Use of PSG design data book is permitted.

1. Discuss the following : 5×4
 - (a) Reverse engineering and Redesign
 - (b) Design of keys
 - (c) Bolt preloading
 - (d) Self energizing condition of brakes.

Section -A

2. (a) Describe the factors to be considered in design for technical and environmental feasibility. 10
- (b) Discuss the classification of engineering materials in detail. 10