M.Sc. DEGREE EXAMINATION, NOVEMBER 2017

FIRST SEMESTER

Branch: Mathematics/Applied Mathematics

Paper IV — NUMERICAL METHODS

(New Syllabus)

me : 3 Hours *Max. Marks : 80*

SECTION – A

Answer any FOUR of the following questions.

(Marks : 4 × 5 marks = 20 marks)

Using the following table find $f(x)$ as a polynomial in x.

x	-1	0	3	6	7
$f(x)$	3	-6	39	822	1611

Explain the method of successive approximations.

Derive Adams – Bashforth formula.

Explain Milne's method.

Explain standard five point formula.

Explain successive over – relaxation method.

Explain Rayleigh – Ritz method.

What are the basic steps involved in finite element method.

SECTION – B

Answer FOUR of the following questions choosing ONE from each unit..

(Marks : 4 × 15 marks = 60 marks)

UNIT I

(a) The following table gives the values of z for different values of x and y. Find z where $x = 2.5$ and $y = 1.5$.

y \ x	0	1	2	3	4
0	0	1	4	9	16
1	2	3	6	11	18
2	6	7	10	15	22
3	12	13	16	21	28
4	18	19	22	27	34

Or

(b) (i) The following table gives the temperature T $(in\,^{\circ}C)$ and lengths l(in mm ... heated rod. If $l = a_0 + a_0 T$, find the best values for a_0 and a_1.

T	20°	30°	40°	50°	60°	70°
l	800.3	800.4	800.6	800.7	800.9	801.0

(ii) Fit a function of the form $y = A_1 e^{\lambda_1 x} + A_2 e^{\lambda_2 x}$ to the data given in the foll... table.

x	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8
y	1.175	1.336	1.510	1.698	1.904	2.129	2.376	2.646	2.942

UNIT II

10. (a) (i) Use the predictor – corrector formulae for tabulating a solution of $10\frac{dy}{dx} = x^2$... $y(0) = 1$ for the range $0.5 \le x \le 1.0$.

(ii) Solve the following boundary value problem using cubic spline tech... $y'' - y = 0$, $y(0) = 0$ and $y(1) = 1$.

Or

(b) Solve the boundary value problems $y'' = y(x)$, $y(0) = 0$, $y(1) = 1$ by shooting meth...

UNIT III

11. (a) Solve the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$.

Subject to the conditions $u(u,0) = 0$ $u(0,t) = 0$, $u(1,t) = t$ using Crank – Nic... method.

Or

(b) Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$

Subject to the initial condition

$u = \sin \pi x$ at $t = 0$ for $0 \le x \le 1$ $u = 0$ at $x = 0$ and $x = 1$ for $t > 0$, using Gauss – S... method.

UNIT IV

12. (a) Solve the boundary value problem defined by $y'' - x = 0$ and $y(0) = 0$, $y'(1) = -$... Rayleigh – Ritz method.

Or

(b) Solve the boundary value problems $y'' + y = -x$, $0 < x < 1$, $y(0) = y(1) = 0$, ... Galerikiu method.
