1.74	0.9857
1.78	0.9781
1.82	0.9691
1.86	0.9584

(b) Evaluate $\int_0^6 \frac{dx}{1+x^2}$ by using :

(i) Trapezoidal rule

(ii) Simpson's $\frac{1}{3}$ rule

(iii) Simpson's $\frac{3}{8}$ rule.

6. (a) Derive the expression for Newton's Cotes quadrature formula for $\int_a^b f(x)\,dx$.

(b) Use Romberg's method to compute $\int_0^1 \frac{dx}{1+x^2}$ correct to four decimal places.

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BB-311

M. Sc. EXAMINATION, May 2018

(Second Semester)

(Main & Re-appear)

MAT502B

MATHEMATICS

Numerical Analysis

Time : 3 *Hours*] [*Maximum Marks :* 100

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. All questions carry equal marks.

Unit I

1. (a) Explain the following terms with examples :

(i) Round-off error

(ii) Truncation error

(iii) Absolute and relative error.

(b) Use the fixed point method to evaluate a root of the equation $x^2 - x - 1 = 0$.

2. Show that Newton-Raphson's method has a quadratic convergence and hence find the real root of the equation $x^2 + 4 \sin x = 0$ near $x = -1.9$ correct to three decimal places. Also discuss the cases of failure of the method.

Unit II

3. (a) Express $u = x^4 - 12x^3 + 24x^2 - 30x + 9$ and its successive differences in factorial notation. Hence show that :

$$\Delta^5 u = 0$$

(b) From the following table, estimate the number of students who obtained marks between 40 and 45 :

Marks	No. of Students
30-40	31
40-50	42
50-60	51
60-70	35
70-80	31

4. What do you understand by spline interpolation ? Explain in detail. For the following values of x and y, find the cubic spline and estimate $y(1.5)$:

x	:	1	2	3	4
y	:	1	5	11	8

Unit III

5. (a) Find the value of cos (1.74) from the following table :

x	$\sin x$
1.7	0.9916

Unit IV

7. What do you understand by Predictor Corrector methods ? Derive expression for Milne's Predictor-corrector method and hence solve $\frac{dy}{dx} = \frac{x+y}{2}$ assuming $y(0) = 2$, $y(0.5) = 2.636$, $y(1.0) = 3.595$, $y(1.5) = 4.968$.

8. (a) Using the shooting method, solve the boundary value problem :

$y''(x) = y(x)$, $y(0) = 0$ and $y(1) = 1.17$.

(b) Solve the boundary value problem :

$$y'' + y = -x, \quad 0 < x < 1$$

with $y(0) = y(1) = 0$

by Galerkin's method.

Unit IV

7. What do you understand by Predictor Corrector methods ? Derive expression for Milne's Predictor-corrector method and hence solve $\frac{dy}{dx} = \frac{x+y}{2}$ assuming $y(0) = 2$, $y(0.5) = 2.636$, $y(1.0) = 3.595$, $y(1.5) = 4.968$.

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by Galerkin's method.