KABARAK  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

COURSE CODE: MATH 314

COURSE TITLE: NUMERICAL ANALYSIS

STREAM: Y3S1

DAY: FRIDAY

TIME: 9.00 – 11.00 A.M.

DATE: 18/03/2011

INSTRUCTIONS:

Answer question **ONE** and any other **TWO** questions

PLEASE TURN OVER

1. a) Let x = 3.55±0.05 and y = 2.73±0.05 determine the maximum error in calculating

$$f(x)=\frac{x}{y}.$$ (5 marks)

b) Two quantities are found to be related as below.

X:	1.0	1.5	2.0	2.5	3.0	3.5	4.0
F(X)	3.1	4.0	4.2	3.8	2.9	2.8	2.7

Assuming f(x) is continous find $\int_1^4 f(x)dx$ numerically using both trapezoidal and Simpson's rules. (6 marks)

c) Use Lagrange interpolation polynomial to calculate f(2) from the following table

x:	0	1	3
f(x)	1	3	35

(6 marks)

d) Use the Newton-Raphson's iteration to estimate the square root of 2 starting with $x_0 = 1.4$ upto 3 iterations correct 5 decimal places. (5 marks)

e) Find f(x) from the following table and also f(7).

x:	0	1	2	3	4	5	6
F(x):-	1	3	19	53	111	199	323

(8 marks)

2. a) Consider the sequence of values of f(x)= (0,0,0,ε ,0,0,0) where ε is an error. Show that

(i) the error spreads and increase in magnitude as the order of the difference is increased.

(ii) the error in each column have binomial coefficients. (6 marks)

b) Find and correct a single error in the following table

x:	0	1	2	3	4	5	6	7
y:	0	0	1	6	24	60	120	210

(7 marks)

c) Perform the computation 0.0218×179

(i) Exactly

(ii) using three truncating arithmetic

(iii) Using three digit rounding arithmetic.

Comment on the errors generated by (i) and (ii). (7 marks)

3. a) Find the divided differences of $f(x)=x^3+x+2$ for the arguments 1, 3, 6, 11. (4 marks)

b) Using the Newton's divided formula find f(x) and f=(6) from the values below.

x:	1	2	7	8
f(x):	1	5	5	4

(8 marks)

c) Apply Newton-Raphson's method, find correct to four decimals the root between 0 and 1 of the equation $x^3-6x+4=0$ Take $x_0=0.7$ (8 marks)

4. a) The population increase of a certain town is given below. Find the rate of growth of the population in 1931 and 1971.

Year, x:	1931	1941	1951	1961	1971
Pop in thousands,y:	40.62	60.80	79.95	104.56	132.65

(10 marks)

b) By Stirling and Bessel method compare the interpolation at x=0.35 from the data

x:	0.1	0.2	0.3	0.4	0.5	0.6
f(x):	1.40	1.56	1.76	2.00	2.28	3.18

(10 marks)

5. a) Using sin(0.1) = 0.09983 and sin(0.2) = 0.19867 find an approximate value of sin(0.15) by lagrange interpolation. (7 marks)

b) Evaluate $I = \int_0^2 \frac{x}{1+x^2} dx$ taking a subdivision of 0.25 using

(i) Trapezoidal rule
(ii) Simpsos's rule
(iii) Direct Integration. (13 marks)