



NATIONAL OPEN UNIVERSITY OF NIGERIA
PLOT 91, CADASTRAL ZONE, NNAMDI AZIKIWE EXPRESSWAY, JABI-ABUJA
FACULTY OF SCIENCES
DEPARTMENT OF COMPUTER SCIENCE
2023_2 EXAMINATIONS

COURSE CODE : CIT 335
COURSE TITLE : Computational Science and Numerical Methods
CREDIT UNIT : 3
TIME ALLOWED : 2½ HOURS
INSTRUCTION : Answer Question 1 and any other Three Questions

- 1a) Write short notes on the following operators used in programming: [4 marks]
i) DIV ii) MOD
- 1b) Convert the following numbers to floating point representation
i) 168,500 ii) 0.0378462 iii) - 0.00746 [3 mks]
- 1c) Convert the following binary numbers to base 10 [7 marks]
i. $(11001.10)_2$ ii. 3107_{16}
- 1d) Mention any two ways of reducing the number of digits in a numerical value? [2 marks]
- 1e) Round the following numbers to 4 decimals
i) $6.322556 = 6.3226$, ii) $6.323501 = 6.3235$ (2 marks)
- 1f. Using a well-labelled diagram, describe the black box representation of a problem [7 marks]
- 2a) State the formal definition of condition number: [3 marks]
condition number is formally defined as the value of the asymptotic worst-case relative change in output for a relative change in input.
- 2b) Convert the following numbers to base 10: [7 marks]
i) $(101.101)_2$ ii) $(ADE)_{16}$
- 2c) With the aid a well-labeled diagram, state the Mean Value theorem of differential calculus. [5 marks]
- 3a) Write short notes on the following
i) Complex floating Point number ii) rational arithmetic iii) Euclidean algorithm
iv) Interval arithmetic [6 marks]
- 3b) Explain the difference between decimal and binary number representations. [4 mks]
- 3c) Convert the following numbers to floating point representation
i) 168,500 ii) 0.0378462 iii) - 0.00746 [3 mks]
- 3d) Round the following numbers to 4 decimals:
i) 1.23767 ii) $0.774539 = 0.7745$, (2 marks)
- 4a) Briefly describe the condition number of a function (4 marks)
- 4b) Multiply of floating-point numbers A and B, where $A=-18.0$ and $B=9.5$ (6 marks)
- 4c) Convert $1/3$ to floating point using seven digits of precision and compute the Absolute errors and Relative errors?(5 marks)

5a) Give a suitable algorithm for i) floating point multiplication ii) Floating point Division [5 marks]

5b. Convert the following Octal numbers 2671_8 and 7777_8 to a Decimal number. (5 marks)

5c) Chop the following numbers to 4 decimals:

i) 0.774539 ii) 6.323001 (5 marks)

6a) Write short notes on the following operators used in programming: [4 marks]

6b). Comment briefly of the following errors regarding machine numbers

i) Rounding off errors ii) Truncation errors iii) Least Squares Error (5 marks)

6c. Convert $FA0A_{16}$ to base 10:

[4 marks]

6d) Chop 1.23767 to 4 decimals: [2 mark]