UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2010 /2011 – 2nd Year Examination – Semester 3

IT3304: Mathematics for Computing-II

PART I – Multiple Choice Question Paper

25th February 2011
(ONE HOUR)

Important Instructions :

- The duration of the paper is **1(one) hour**.
- The medium of instruction and questions is English.
- The paper has **22 questions** and **5 pages**.
- All questions are of the MCQ (Multiple Choice Questions) type.
- All questions should be answered.
- Each question will have 5 (five) choices with **one or more** correct answers.
- All questions will carry equal marks.
- There will be a penalty for incorrect responses to discourage guessing.
- The mark given for a question will vary from 0 (*All the incorrect choices are marked & no correct choices are marked*) to +1 (*All the correct choices are marked & no incorrect choices are marked*).
- Answers should be marked on the special answer sheet provided.
- Note that questions appear on both sides of the paper.
  If a page is not printed, please inform the supervisor immediately.

Mark the correct choices on the question paper first and then transfer them to the given answer sheet which will be machine marked. **Please completely read and follow the instructions given on the other side of the answer sheet before you shade your correct choices.**

1) If A= $\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix}$, which of the following is(are) true about A?

(a) A is a diagonal matrix.
(b) A is a non singular matrix.
(c) A is a skew symmetric matrix.
(d) A is an upper triangular matrix.
(e) A is a symmetric matrix.

2) If A= $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$, which of the following is(are) true about A?

(a) A is an orthogonal matrix.
(b) $(-A)^T = (-A)^{-1}$.
(c) –A is not an orthogonal matrix.
(d) $A^T = A^{-1}$.
(e) A(-A)=(-A).

3) Let $A = \frac{1}{2}\begin{pmatrix} 2 & -4 & 2 & -2 \\ 0 & 0 & -3 & 5 \\ 0 & 8 & 16 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$. Then $|A|$ equals

(a) 16	(b) 3	(c) 0
(d) -3	(e) 32	

4) Consider the following system of ***m*** linear equations in ***n*** unknowns.

$$\begin{aligned} a_{11}x_1 + a_{12}x_2 + \ldots\ldots + a_{1n}x_n &= y_1 \\ a_{21}x_1 + a_{22}x_2 + \ldots\ldots + a_{2n}x_n &= y_2 \\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \\ a_{m1}x_1 + a_{m2}x_2 + \ldots\ldots + a_{mn}x_n &= y_m \end{aligned}$$

Where $y_1, y_2, \ldots\ldots y_m$ and a_{ij} for $1 \le i \le m$, $1 \le j \le n$ are real numbers and $x_1, x_2, \ldots\ldots x_n$ are n unknowns.

If the above system of linear equations is homogeneous, which of the following is(are) true about the system?

(a) The system is consistent.
(b) The system is inconsistent.
(c) $y_1 = y_2 = \ldots\ldots = y_m = 0$.
(d) The system may have a unique solution.
(e) The system may have infinitely many solutions.

5) Let A = $\begin{pmatrix} 3 & 1 \\ 1 & 2 \end{pmatrix}$. If B and C are the adjoint and cofactor matrix of A respectively, which of the following is(are) true?

(a) B = $\frac{1}{5}\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$, C = $\begin{pmatrix} -2 & 1 \\ 1 & -3 \end{pmatrix}$

(b) B = $5\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$, C = $\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$

(c) B = $\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$, C = $\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$

(d) B = $\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$, C = A^T

(e) B = $\begin{pmatrix} 2 & -1 \\ -1 & 3 \end{pmatrix}$, C = B^T

6) Let A= $\begin{bmatrix} 8 & 9 & 2 \\ 3 & 6 & 7 \\ 5 & 4 & 1 \end{bmatrix}$. Find $|A^{-1}|$.

(a) $|A^{-1}| = -\frac{1}{500}$ (b) $|A^{-1}| = 428$ (c) $|A^{-1}| = \frac{1}{76}$ (d) $|A^{-1}| = -500$ (e) $|A^{-1}| = \frac{1}{428}$

7) $\int_{-5}^{5} x e^{-x^4} dx$ is equal to

(a) 10 (b) 1 (c) 0 (d) -10 (e) -1

8) If $\sum_{r=1}^{n} r = \frac{n(n+1)}{2}$ and $\sum_{r=1}^{n} r^2 = \frac{n(n+1)(2n+1)}{6}$ then $\sum_{r=1}^{n} 6(3+r)^2$ is equal to

(a) $2n^3 + 21n^2 + 61n$ (b) $2n^3 + 21n^2 + 71$ (c) $2n^3 + 21n^2 + 73n$
(d) $2n^3 + 21n^2$ (e) $2n^3 + 61n + 1$

9) If $x_n = \frac{1}{n+1} + \frac{1}{n+2} + \cdots + \frac{1}{n+n}$ where n is a positive integer greater than 1, then

(a) $x_n < 1$ (b) $x_n > 1$ (c) $x_n < \frac{1}{2}$
(d) $x_n > \frac{1}{2}$ (e) $x_n > 2$

10) $\sum_{n=1}^{100} \frac{1}{n(n+1)}$ is equal to

(a) $\frac{101}{100}$	(b) $\frac{100}{101}$	(c) $\frac{99}{100}$
(d) $\frac{100}{99}$	(e) $\frac{101}{99}$	

11) If $y_n - y_{n-1} = 2^n$, $n \in N$ then $y_5 - y_1$ is equal to

(a) 58	(b) 60	(c) 48
(d) 54	(e) 50	

12) $\int e^x \cos x dx$ is equal to

(a) $\frac{1}{2}(\sin x + \cos x)e^x + C$	(b) $\frac{1}{2}(\sin x - \cos x)e^x + C$	(c) $-\frac{1}{2}(\sin x + \cos x)e^x + C$
(d) $\frac{1}{2}(\cos x - \sin x)e^x + C$	(e) $(\cos x + \sin x)e^x + C$	Here C is an arbitrary constant.

13) The derivative of $f(x) = x^{\sqrt{x+1}}$ is equal to

(a) $x^{\sqrt{x+1}}\left[\frac{\sqrt{x+1}}{x} - \frac{\ln x}{2\sqrt{x+1}}\right]$	(b) $x^{\sqrt{x+1}}\left[\frac{\sqrt{x+1}}{x} + \frac{\ln x}{2\sqrt{x+1}}\right]$	(c) $x^{\sqrt{x+1}}\left[\frac{\sqrt{x+1}}{x} + \frac{\ln x}{2}\right]$
(d) $x^{\sqrt{x+1}}\left[\frac{\sqrt{x+1}}{x} + \frac{\ln x}{2\sqrt{x+1}}\right]$	(e) $x^{\sqrt{x+1}}\left[\frac{\sqrt{x+1}}{x} - \frac{\ln x}{\sqrt{x+1}}\right]$	

14) The n^{th} derivative of $f(x) = (1+x)^{-1}$ at $x = 0$ is equal to

(a) $n!$	(b) $-(n!)$	(c) $-n$
(d) n	(e) $(-1)^n n!$	

15) Which of the following is(are) always true for any three vectors $\underline{a}$, $\underline{b}$ and $\underline{c}$?

(a) $\lvert \underline{a} + \underline{b} \rvert \le \lvert \underline{a} \rvert + \lvert \underline{b} \rvert$	(b) $\lvert \underline{a} - \underline{b} \rvert \le \lvert \underline{a} \rvert - \lvert \underline{b} \rvert$	(c) $\lvert \underline{a} - \underline{b} \rvert \le \lvert \underline{a} \rvert + \lvert \underline{b} \rvert$
(d) $\lvert \underline{a} - \underline{b} - \underline{c} \rvert \le \lvert \underline{a} \rvert - \lvert \underline{b} \rvert - \lvert \underline{c} \rvert$	(e) $\lvert \underline{a} + \underline{b} + \underline{c} \rvert \le \lvert \underline{a} + \underline{b} \rvert + \lvert \underline{c} \rvert$	

16) If $\underline{a} = 2\underline{i} + \underline{j} + \underline{k}$ and $\underline{b} = \underline{i} - \underline{j} - \underline{k}$ in the usual notation then

(a) $\underline{a}$ and $\underline{b}$ are parallel.	(b) $\underline{a}$ and $\underline{b}$ are perpendicular.	(c) $\underline{a} - 2\underline{b}$ and $\underline{a} + \underline{b}$ are parallel.
(d) $\underline{a}$ and $\underline{a} + \underline{b}$ are parallel.	(e) $\underline{a} - 2\underline{b}$ and $\underline{a} + \underline{b}$ are perpendicular.	

17) $(2\underline{i} - 3\underline{j}) \cdot [(\underline{i} + \underline{j} - \underline{k}) \times (3\underline{i} - \underline{k})]$ in the usual notation is equal to

(a) 2	(b) -5	(c) 5
(d) 4	(e) -4	

18) For any two non-zero vectors $\underline{a}$ and $\underline{b}$ the vector $\underline{a}$. ($\underline{a} \times \underline{b}$) is equal to

(a) $\lvert\underline{a}\rvert\underline{b}$	(b) $\lvert\underline{b}\rvert$	(c) $\lvert\underline{a} \cdot \underline{b}\rvert$
(d) $-\underline{b}$	(e) 0	

19) Which of the following variables are discrete random variables?

(a) The number of new laptop computers sold by a salesperson in a year.
(b) The time taken to complete a single transaction by a customer at an ATM.
(c) The number of customers entering "Eat More" restaurant on a particular night.
(d) The amount of fuel in your car's fuel tank.
(e) The outside temperature today.

20) It is claimed that ten percent of new mobile phones of a well known brand will require warranty service within the first year. The number of phones sold in May 2010 is 30. Which of these statements is(are) correct about the number of mobile phones sold in May that will require warranty service within the first year?

(a) It follows a binomial distribution with n = 30, p = 0.1
(b) It follows a binomial distribution with n = 30, p = 0.01
(c) It follows a binomial distribution with mean number 3
(d) It follows a binomial distribution with standard deviation 2.7
(e) It follows a binomial distribution with variance 2.7

21) The number of claims for missing baggage at a busy airport for a well known airline averages four per day. Which of these statements is(are) correct about the number of missing baggage claims per day?

(a) It follows a Poisson distribution with mean 2.
(b) It follows a Poisson distribution with mean 4.
(c) It follows a Poisson distribution with standard deviation 2.
(d) It follows a Poisson distribution with standard deviation 4.
(e) It follows a Poisson distribution with standard deviation 16.

22) Past data indicates that the time to download a web page is normally distributed with a mean μ =7 seconds and a variance σ^2 = 4. If it is found that P[Z < 1]= 0.8413, find the download time of that web page in seconds. Here Z is the standard normal random variable.

(a) 3 (b) 5 (c) 9 (d) 11 (e) 7

****