UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2011 /2012 – 2nd Year Examination – Semester 3

IT3304: Mathematics for Computing-II

PART I – Multiple Choice Question Paper

24th February 2012

(ONE HOUR)

Important Instructions :

- The duration of the paper is 1(one) hour.
- The medium of instruction and questions is English.
- The paper has questions 24 and 6 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 is an $m \times n$ matrix where $m \neq n$, which of the following is(are) **not** true about A?

(a) A could be a diagonal matrix.
(b) A could be a zero matrix.
(c) A could be an upper triangular matrix.
(d) A could be an orthogonal matrix.
(e) A could be a column matrix.

2) Let A, B and C be three matrices such that A $_{\times}$ = B $_{\times}$ C $_{\times}$. Which of the following **cannot** be true?

(a) , , , , , ∈ ≠ .
(b) , , , , , ∈ = .
(c) , , , , , ∈ = , = , = .
(d) , , , , , ∈ ≠ .
(e) , , , , , ∈ ≠ .

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

(a) 288	(b) -288	(c) -96
(d) 0	(e) 96	

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

+ + ……. + = 0
+ + ……. + = 0
……………………………………….
+ + ……. + = 0

where $x_1, x_2, \ldots\ldots x_n$ are n unknowns.

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

(a) The system may have a unique solution.
(b) The system may have infinitely many solutions.
(c) $x_1 = x_2 = \ldots\ldots. = x_n = 0$ cannot be a solution of the system.
(d) $x_1 = x_2 = \ldots\ldots. = x_n = 0$ is the only solution of the system.
(e) The system has no solutions.

5) Let A = $\begin{pmatrix} 1 & 0 & -1 \\ 0 & 1 & 1 \\ \beta & 0 & \alpha \end{pmatrix}$. If adj A = $\begin{pmatrix} 2 & 0 & 1 \\ 1 & 3 & -1 \\ -1 & 0 & 1 \end{pmatrix}$, find and .

(a) = 2 and = 1.	(b) = 1 and = 1.	(c) = −1 and = 1.
(d) = 2 and = −1.	(e) = 1 and = 0.	

6) Let A be a square matrix of order n. If A is non-singular, which of the following is(are) true?

(a) AA = I	(b) A = A
(c) AA = I	(d) AA = $(I_n)^T$
(e) |A | = — | |	

7) If $y_n = 2y_{n-1} - 1, \quad n \geq 1$ and $y_0 = 2$, then y_5 is equal to

(a) 33	(b) 35	(c) 37
(d) 30	(e) 29	

8) Suppose (x_n) is a convergent sequence of real numbers such that = ——, $n \geq 1$,

and $\lim\limits_{n\to\infty} x_n > 0$. Then $\lim\limits_{n\to\infty} x_n$ is equal to

(a) $\frac{3+\sqrt{17}}{4}$	(b) $\frac{3-\sqrt{17}}{4}$	(c) $\frac{-3+\sqrt{17}}{2}$
(d) - $\frac{\sqrt{\ }}{\ }$	(e) $\frac{3+\sqrt{17}}{2}$	

9) The sum $\sum_{n=1}^{4}\left(n^2 - 2n + \frac{1}{n}\right)$ is equal to

(a) $133/12$	(b) $145/12$	(c) $157/12$
(d) $179/12$	(e) $191/12$	

10) The sum $\sum_{n=1}^{98}\frac{1}{n^2+3n+2}$ is equal to

(a) $102/100$	(b) $98/100$	(c) $51/100$
(d) $50/100$	(e) $49/100$	

11) If $I_n = \int_0^{\infty} x^n e^{-x} dx = n\int_0^{\infty} x^{n-1} e^{-x} dx$, then I_n is equal to

(a) 0	(b) n	(c) n^2
(d) $(n-1)!$	(e) $n!$	

12) The first derivative of $2^{x^{x^2}}$ is

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

13) If $\dfrac{dC}{dq} = \dfrac{2q+1}{q^2+1}$ then $C(\sqrt{3})$ - $C(1)$ is equal to

(a) $\ln 5 + \dfrac{\pi}{12}$	(b) $\ln 5 - \dfrac{\pi}{12}$	(c) $\ln 2 + \dfrac{\pi}{12}$
(d) $\ln 2 - \dfrac{\pi}{12}$	(e) $\ln 2 - \dfrac{\pi}{6}$	

14) If $f(x) = x^2.3^{4x-1}$ then the value(s) of x satisfying $f'(x) = 0$ is(are)

(a) 0 and $\dfrac{1}{2\ln 3}$	(b) $-\dfrac{1}{4\ln 3}$	(c) $\dfrac{1}{2\ln 3}$
(d) 0 and $-\dfrac{1}{2\ln 3}$	(e) 0 and $-\dfrac{1}{4\ln 3}$	

15) If $(\underset{\sim}{i}\cos\theta + \underset{\sim}{j}\sin\theta)\bullet(\underset{\sim}{i}\cos\theta - \underset{\sim}{j}\sin\theta) = 0$ in the usual notation, then θ can take the value(s)

(a) $\dfrac{\pi}{8}$	(b) $\dfrac{\pi}{4}$	(c) $-\dfrac{\pi}{4}$
(d) $\dfrac{\pi}{2}$	(e) $-\dfrac{\pi}{2}$	

16) Which of the following vectors is(are) perpendicular to the vector $(\underset{\sim}{i} + 2\underset{\sim}{j} + 3\underset{\sim}{k}) \times (-\underset{\sim}{i} + 4\underset{\sim}{k})$ in the usual notation?

(a) $2\underset{\sim}{j} + 7\underset{\sim}{k}$	(b) $4\underset{\sim}{i} + 2\underset{\sim}{j} - 9\underset{\sim}{k}$	(c) $\underset{\sim}{i} + 3\underset{\sim}{j} + 8\underset{\sim}{k}$
(d) $\underset{\sim}{i} + 2\underset{\sim}{j} + 6\underset{\sim}{k}$	(e) $\underset{\sim}{j} + 5\underset{\sim}{k}$	

17) If the non-zero vector $a\underline{i}+2a\underline{j}-a^2\underline{k}$ is perpendicular to the vector $-\underline{i}-a\underline{j}+a\underline{k}$ in the usual notation, then a is equal to

(a) -2	(b) -1	(c) 1
(d) 2	(e) 3	

18) If $\underline{x} = \underline{i}+2\underline{j}+3\underline{k}$, $\underline{y} = \underline{i}-\underline{j}$ and $\underline{z} = a\underline{i}+b\underline{j}+c\underline{k}$ in the usual notation are collinear, then two possibilities for the vector $\underline{z}$ are

(a) $\underline{i}+\underline{j}+\underline{k}$ and $\underline{i}+\frac{1}{3}\underline{j}+\frac{2}{3}\underline{k}$	(b) $\underline{i}+\underline{j}+\underline{k}$ and $\underline{i}-\frac{1}{3}\underline{j}+\frac{2}{3}\underline{k}$	(c) $\underline{i}+\underline{j}+2\underline{k}$ and $\underline{i}+\frac{1}{3}\underline{j}+\frac{2}{3}\underline{k}$
(d) $\underline{i}+\underline{j}-2\underline{k}$ and $\underline{i}-\frac{1}{3}\underline{j}+\frac{2}{3}\underline{k}$	(e) $\underline{i}+\underline{j}+2\underline{k}$ and $\underline{i}-\frac{1}{3}\underline{j}+\frac{2}{3}\underline{k}$	

19) If $\underline{a} = a_1\underline{i}+a_2\underline{j}+a_3\underline{k}$ then $(\underline{a}\bullet\underline{i})\underline{i} + (\underline{a}\bullet\underline{j})\underline{j} + (\underline{a}\bullet\underline{k})\underline{k}$ in the usual notation is equal to

(a) 0	(b) $\underline{a}$	(c) $3\underline{a}$
(d) $\underline{a}\bullet(\underline{i}+\underline{j}+\underline{k})$	(e) $a_1+a_2+a_3$	

20) Consider the following three random variables.
X: The number of tattoos a randomly selected person has.
Y: The outside temperature today.
Z : The number of women in a random sample of 10 women who are taller than 68 inches.

Which is correct about each type of variable?

(a) X : Discrete, Y : Continuous, Z : Continuous
(b) X : Discrete, Y : Discrete, Z : Continuous
(c) X : Discrete, Y : Continuous, Z : Discrete
(d) X : Discrete, Y : Discrete, Z : Discrete
(e) X : Continuous, Y : Continuous, Z : Discrete

21) Let X be a number selected at random from the first three positive odd integers. If you assume equal probabilities on these three integers, what is the calculated value of E[(15-X)]?

(a) 3	(b) 6	(c) 9
(d) 12	(e) 15	

22) The probability of passing a certain national level examination is 0.8. If 3 candidates are selected at random, then what is the probability that exactly one candidate will fail?

(a) ${}^3C_1(0.8)^1(0.2)^2$	(b) ${}^3C_1(0.2)^1(0.8)^2$	(c) ${}^3C_1(0.8)^1(0.2)^1$
(d) ${}^3C_1(0.8)^1(0.8)^2$	(e) ${}^3C_1(0.2)^1(0.2)^2$	

23) Based on past experience, it can be assumed that the number of viruses detected on a particular day follows a Poisson distribution with an average of 2 per day. What is the probability that 10 viruses will be detected in a period of 5 days?

(a) $\dfrac{e^{-2}2^{10}}{10!}$	(b) $\dfrac{e^{-10}10^{10}}{10!}$	(c) $5\times\dfrac{e^{-2}2^{10}}{10!}$
(d) $\dfrac{e^{-2}10^{2}}{2!}$	(e) $\left(\dfrac{e^{-2}2^{10}}{10!}\right)^{5}$	

24) Past data indicate that the scores on an IQ test are normally distributed with mean 80 and standard deviation 4. If P[Z > -1] = 0.8413, find the score on the IQ test corresponding to this Z value. Here Z is the standard normal random variable.

(a) 64	(b) 78
(c) 76	(d) 84
(e) 96	

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