UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2013 /2014 – 2nd Year Examination – Semester 3

IT3304: Mathematics for Computing-II

PART 1 – Multiple Choice Question Paper
28th February 2014
(ONE HOUR)

Important Instructions :

- The duration of the paper is **1(one) hour**.
- The medium of instruction and questions is English.
- The paper has 23 **questions** 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) Which of the following is/are true about a diagonal matrix?

(a) It is always a square matrix.
(b) No element along the diagonal is equal to zero.
(c) It is always an upper triangular matrix.
(d) It is always an identity matrix.
(e) It is always a symmetric matrix.

2) Find $A^2 - 2B$ where $A = \begin{bmatrix} 1 & -2 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & -6 \\ 12 & 8 \end{bmatrix}$.

(a) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (e) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$

3) Let $A = \begin{bmatrix} 3 & 2 & 2 & -2 \\ 12 & 2 & 12 & 2 \\ 11 & 0 & 11 & 0 \\ 21 & 0 & 21 & 1 \end{bmatrix}$. Then |A| is equal to

(a) 11 (b) -11 (c) 22
(d) 0 (e) -22

4) If $A=\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ and $B^{-1}=\begin{bmatrix} 2 & 0 & 1 \\ 1 & 3 & -1 \\ -1 & 0 & 2 \end{bmatrix}$, then find $((BA)^T)^{-1}$

(a) $\begin{bmatrix} 1/2 & 0 & 0 \\ 0 & 1/3 & 0 \\ 0 & 0 & 1/2 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 0 & 1 \\ 1 & 6 & -1 \\ -1 & 0 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 1 \\ 1 & 1 & -1 \\ -1 & 0 & 1 \end{bmatrix}$

(d) $\begin{bmatrix} 4 & 1 & -1 \\ 0 & 6 & 0 \\ 1 & -1 & 4 \end{bmatrix}$ (e) $\begin{bmatrix} 1 & 1/3 & -1/2 \\ 0 & 1 & 0 \\ 1/2 & -1/3 & 1 \end{bmatrix}$

5) Let $A=\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. Find $(\text{adj } A)^T$

(a) $\begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} -4 & 3 \\ 2 & -1 \end{bmatrix}$ (e) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

6) Let A = (a_{ij}) be an upper triangular matrix of order *n*. Which of the following must be true about A?

(a) $a_{ij} = 0$ whenever $i < j$, where $i, j \in \{1, 2, \ldots n\}$.
(b) $a_{ij} = 0$ whenever $i > j$, where $i, j \in \{1, 2, \ldots n\}$.
(c) All the entries above the diagonal are zero.
(d) $a_{ij} \neq 0$ whenever $i = j$, where $i, j \in \{1, 2, \ldots n\}$.
(e) All the entries below the diagonal are zero.

7) If a geometric progression has first term '*a*' and common ratio $\frac{1}{\sqrt{2}}$, then the sum to infinity is equal to

(a) $a(2+\sqrt{2})$ (b) $a\left(2-\sqrt{2}\right)$ (c) $a\left(1+\sqrt{2}\right)$
(d) $\frac{a\sqrt{2}}{1+\sqrt{2}}$ (e) $\frac{a\sqrt{2}}{\sqrt{2}-1}$

8) The sum $\sum_{r=10}^{100}(r-10)$ is equal to

(a) 4050 (b) 4090 (c) 4095
(d) 4950 (e) 5005

9) If the 3rd , 5th and 8th terms of an arithmetic progression with a common difference of 3 are three consecutive terms of a geometric progression , then its common ratio is

(a) $\frac{1}{2}$ (b) $\frac{2}{3}$ (c) $\frac{3}{4}$
(d) $\frac{3}{2}$ (e) 2

10) The 10th term of the sequence $\frac{1}{2}$, 1, $\frac{9}{8}$, 1, $\frac{25}{32}$, $\frac{36}{64}$,…… is equal to

(a) 1 (b) $\frac{25}{256}$ (c) $\frac{125}{256}$
(d) $\frac{5}{128}$ (e) $\frac{125}{128}$

11) The area bounded by the curves $y_1 = 1 - x^2$ and $y_2 = x^2 - 1$ is

(a) $\frac{2}{3}$	(b) $\frac{4}{3}$	(c) $\frac{7}{3}$
(d) $\frac{8}{3}$	(e) $\frac{16}{3}$	

12) $\int_{-10}^{10} x^3 \sin^2 x \cos x \, dx$ is equal to

(a) -5	(b) 5	(c) -10
(d) 10	(e) 0	

13) The n^{th} derivative of $f(x) = \sin x$ is given by

(a) $\sin\left(\frac{n\pi}{2} + x\right)$	(b) $\cos\left(\frac{n\pi}{2} + x\right)$	(c) $\sin(n\pi + x)$
(d) $\sin\left(\frac{n\pi}{2} - x\right)$	(e) $\cos(n\pi + x)$	

14) If $f(x) = \sqrt{3x+1}$ then

(a) $f''(x) + f'^2(x) = 0$	(b) $f'(x) + f''^2(x) = 0$	(c) $f(x)f'(x) + f''(x) = 0$
(d) $f(x)\, f''(x) + f'^2(x) = 0$	(e) $f(x)f'(x) - f''(x) = 0$	

15) If points *A* and *B* have position vectors $(2t+1)\underline{i} + (t+1)\underline{j} + 3\underline{k}$ and $(t+1)\underline{i} + 5\underline{j} + 2\underline{k}$ respectively, then the minimum value of $\left|\overrightarrow{AB}\right|$ is

(a) 3	(b) 5	(c) 9
(d) 11	(e) $\sqrt{11}$	

16) If $2\underline{i} - 6\underline{j} + \underline{k}$ and $5\underline{i} + 2\underline{j} + \alpha\underline{k}$ are perpendicular vectors, then the value of α is,

(a) 0	(b) 1	(c) 2
(d) 3	(e) 4	

17) In the triangle OAB , P is the midpoint of AB and Q is a point on OP such that $OQ = \frac{3}{4}\ OP$. If $\overrightarrow{OA} = \underline{a}$ and $\overrightarrow{OB} = \underline{b}$, then $\overrightarrow{AQ}$ is given by

(a) $\frac{3\underline{b} - 5\underline{a}}{8}$ (b) $\frac{5\underline{a} - 3\underline{b}}{8}$ (c) $\frac{3\underline{a} + 5\underline{a}}{8}$
(d) $\frac{3\underline{a} - 4\underline{b}}{8}$ (e) $\frac{4\underline{a} + 5\underline{b}}{8}$

18) In the triangle OAB , P is the midpoint of AB and Q is a point on OP such that $OQ = \frac{3}{4}\ OP$. If $\overrightarrow{OA} = \underline{a}$, $\overrightarrow{OB} = \underline{b}$, R is a point on OB such that $OR = k.OB$ $(0 < k < 1)$ and AQR is a straight line, then the value of k is

(a) $\frac{3}{7}$ (b) $\frac{2}{5}$ (c) $\frac{3}{5}$ (d) $\frac{3}{4}$ (e) $\frac{1}{2}$

19) Which one of the following is/are discrete random variable/s?

(a) Your national identity card number without the English letter.
(b) Your island rank at the G.C.E. (A/L) examination**.**
(c) The number of questions completed by you by the end of the allocated time period in an examination**.**
(d) The number of women taller than 68 inches in a random sample of 50 men.
(e) Downloaded size in Kilo-bites (Kb) of a MP3 file.

20) The mean and variance of a binomial distribution are 10 and 8 respectively. What are the parameters of this distribution?

(a) n = 10, p = 0.8 (b) n = 10, p = 0.2 (c) n = 50, p = 0.2
(d) n = 50, p = 0.8 (e) n = 100, p = 0.2

21) If the standard deviation of a Poisson distribution is 2 then its mean is

(a) 0.25 (b) 0.5 (c) 1.41 (d) 2 (e) 4

22) Suppose that a random variable X follows an exponential probability distribution given below.

$$f_X(x) = \begin{cases} 3e^{-3x} & x \geq 0 \\ 0 & otherwise \end{cases}$$

The mean of this distribution is

(a) 1/3 (b) 1/9 (c) 0
(d) 3 (e) 9

23) On average, six persons use an automatic teller machine (ATM) during the lunch hour at a certain location in Colombo city. What is the probability that at least one person will use the ATM during the lunch hour?

(a) $\frac{e^{-6}6^{0}}{0!}$

(b) $1-\frac{e^{-6}6^{0}}{0!}$

(c) $\frac{e^{-6}6^{0}}{0!}-1$

(d) $1-\frac{e^{-6}6^{1}}{1!}$

(e) $1-\frac{e^{-6}6^{0}}{0!}-\frac{e^{-6}6^{1}}{1!}$

****