UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)

Academic Year 2009 /2010 – 2nd Year Examination – Semester 3

IT3303: Mathematics for Computing-II

PART I – Multiple Choice Question Paper

19th March 2010

(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 22** 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 is an $m \times n$ matrix, which of the following is(are) true about A?

(a) A is a row matrix if $n = 1$.
(b) A is a column matrix if $m = 1$.
(c) A is a square matrix if $m = n$.
(d) $A + (-A)$ is a zero matrix if $m = n$.
(e) A is not a row matrix if $m = n = 1$.

2) Let A be the identity matrix of order n. Which of the following is(are) true about A?

(a) A is a diagonal matrix as well as a symmetric matrix.
(b) A is an upper triangular matrix as well as a lower triangular matrix.
(c) $\frac{1}{2}(A + A)$ is a diagonal matrix but not the identity matrix.
(d) $\frac{1}{2}(A.A)$ is a diagonal matrix but not an identity matrix.
(e) $A + (-A)$ is an upper triangular matrix as well as a diagonal matrix.

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

(a) 0 (b) 128 (c) 32
(d) 8 (e) 2

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

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

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

If the above system of linear equations is not homogeneous, which of the following is(are) true about the system?

(a) The system may be consistent.
(b) The system may be inconsistent.
(c) $x_1 = x_2 = ... = x_n = 0$ is always a solution of the system.
(d) $x_1 = x_2 = ... = x_n = 0$ is not a solution of the system.
(e) The system may have infinitely many solutions.

5) Let $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 2 \\ 9 & 1 & 3 \end{pmatrix}$. If B and C are the adjoint and cofactor matrix of A respectively, which of the following is(are) true?

(a) $\|A^{-1}\| = \frac{1}{\|A\|}$	(b) $A^{-1} = \frac{B^T}{\|A\|}$	(c) $A^{-1} = \frac{C}{\|A\|}$
(d) $A^{-1} = B$	(e) $B = C^T$	

6) If A and B are matrices of order n, then which of the following is(are) true?

(a) $(A(A+B))^T = (A^2)^T + A^T B^T$	(b) $(A(A+B))^T = (A^T)^2 + A^T B^T$
(c) $(A(A+B))^T = (A^T)^2 + B^T A^T$	(d) $(A(A+B))^T = (A^2)^T + B^T A^T$
(e) $(A(A+B))^T = B^T A^T + A^T$	

7) Let (x_n) be the convergent sequence with $x_1 = 1$ and for $n \geq 1$, $x_{n+1} = \frac{x_n}{x_n + 1}$. Then $\lim_{n\to\infty} x_n$ equals

(a) $\frac{1}{3}$	(b) $\frac{1}{2}$	(c) $\frac{1}{4}$
(d) 0	(e) 1	

8) If $I_0 = \frac{1}{2}$ and for $k \geq 1$, $I_k = \frac{k}{2} I_{k-1}$, then I_n equals

(a) $\frac{(n-1)!}{2^n}$	(b) $\frac{n!}{2^n}$	(c) $\frac{n!}{2^{n+1}}$
(d) $\frac{n!}{2^{n-1}}$	(e) $\frac{(n-1)!}{2^{n-1}}$	

9) The sum $1 + 2(2) + 3(2)^2 + 4(2)^3 + \ldots\ldots + 10(2)^9$ equals

(a) $11(2)^9 + 1$	(b) $11(2)^{10} - 1$	(c) $9(2)^{10} + 1$
(d) $9(2)^{10} - 1$	(e) $9(2)^9 + 1$	

10) If $y_0 = 5$ and $y_n = \frac{1}{2} y_{n-1}$ for $n \geq 1$, then $\sum_{n=0}^{\infty} y_n$ equals

(a) 5	(b) 20	(c) 15
(d) 10	(e) 0	

11) $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} 2x\cos x\,dx$ equals

(a) 0	(b) π	(c) 4π
(d) 2π	(e) $\frac{\pi}{2}$	

12) If $f(x) = \sqrt{x^2+1}$, then $[f'(x)]^2 + f''(x)f(x)$ equals

(a) 0	(b) 1	(c) x
(d) $2x$	(e) $\frac{x}{\sqrt{x^2+1}}$	

13) $\int_0^2 |x-1|\,dx$ equals

(a) 0	(b) $\frac{1}{2}$	(c) 1
(d) 2	(e) 4	

14) If $f(x) = \ln(1+x)$, then the n^{th} order derivative of f at $x = 0$ for odd n equals

(a) $-(n!)$	(b) $-[(n-1)!]$	(c) $(n-1)!$
(d) $n!$	(e) $(-1)^{n-1}(n-1)!$	

15) If $\underline{p} = \underline{i} - \underline{j}$ and $\underline{q} = \underline{j} + \underline{k}$ then, $\underline{p} \cdot \underline{q} + |\underline{p} \times \underline{q}|^2$ equals

(a) 1	(b) 2	(c) 3
(d) 4	(e) 5	

16) Which of the following are meaningful operations for three non-zero vectors $\underline{p}$, $\underline{q}$, $\underline{r}$?

(a) $(\underline{p} \cdot \underline{q}) + \underline{r}$	(b) $(\underline{p} \times \underline{q}) + \underline{r}$	(c)) $\underline{p} \times (\underline{q} \times \underline{r})$
(d) $\underline{p} \cdot (\underline{q} \cdot \underline{r})$	(e) $(\underline{p} \times \underline{q}) \cdot \underline{r}$	

17) If $\vec{OA} = (\underline{i} + 2\underline{j} + 3\underline{k})$ and $\vec{OB} = (2\underline{i} + 2\underline{j} + 4\underline{k})$, then the unit vector in the direction of $\vec{AB}$ is

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

18) Which one of these variables is a binomial random variable?

(a) The time it takes for a randomly selected student to complete a multiple choice exam
(b) The number of textbooks a randomly selected student bought this term
(c) The number of women taller than 68 inches in a random sample of 10 women
(d) The number of CDs a randomly selected person owns
(e) The number of accidents occurring per day at a specific junction

19) The probability is p = 0.60 that a patient with a certain disease will be successfully treated with a new medical treatment. Suppose that the treatment is used on 40 patients. What is the "expected value" of the number of patients who are successfully treated?

(a) 6 (b) 12 (c) 15
(d) 24 (e) 32

20) Which one of the following is a **false** statement about the standard normal distribution?

(a) Its standard deviation σ can vary with different data sets.
(b) It is bell-shaped.
(c) It is symmetric around 0.
(d) Its mean is equal to 0.
(e) The total area under the standard normal curve is equal to 1.0

21) Which one of these variables is a continuous random variable?

(a) The time it takes for a randomly selected student to complete an exam
(b) The number of tattoos a randomly selected person has
(c) The number of women taller than 68 inches in a random sample of 5 women
(d) The number of correct guesses on a multiple choice test
(e) The number of students failing an examination

22) Suppose that a train reached its destination "*T*" minutes later than the scheduled time. Here, *T* is considered as a discrete random variable with the following probability distribution function.

t	0	1	2	3	4	5
$P(T= t)$	0.40	x	y	0.15	0.10	0.05

If it is known that $E(T) = 1.6$, and $E(T^2) = 5.1$, what are the values of x and y?

(a) $x = 0.15,\ y = 0.15$ (b) $x = 0.20,\ y = 0.10$
(c) $x = 0.10,\ y = 0.20$ (d) $x = 0.25,\ y = 0.05$
(e) $x = 0.05,\ y = 0.25$

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