UNIVERSITY OF COLOMBO, SRI LANKA

UNIVERSITY OF COLOMBO SCHOOL OF COMPUTING

DEGREE OF BACHELOR OF INFORMATION TECHNOLOGY (EXTERNAL)
Academic Year 2016 – 2nd Year Examination – Semester 3

IT3305: Mathematics for Computing-II

PART I – Multiple Choice Question Paper

6th May 2016

(ONE HOUR)

Important Instructions :

- The duration of the paper is **1(one) hour**.
- The medium of instruction and questions is English.
- The paper has 25 **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) Let A, B, and C be any three square matrixes of the same order. Which of the following is/are true about them?

(a) A+(B+C)=(A+B)+C.
(b) A(BC)=(AB)C.
(c) A(B+C)=AB+AC.
(d) AB+AC=BA+CA.
(e) A+B+C=C+B+A.

2) Let $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 3 & 2 \end{bmatrix}$. Then ($A^2$ - B^2) is equal to

(a) (A-B)(A+B) (b) $\begin{bmatrix} -5 & -3 \\ -7 & -10 \end{bmatrix}$ (c) $\begin{bmatrix} -6 & -6 \\ -5 & -9 \end{bmatrix}$
(d) $\begin{bmatrix} 7 & 6 \\ 4 & 7 \end{bmatrix}$ (e) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

3) Let A and B be two square matrices of the same order. Which of the following is/are equal to $(AB+BA)^T$?

(a) $(A^T B^T + B^T A^T)$ (b) $2\ A^T B^T$ (c) $2B^T A^T$
(d) $(AB)^T+(BA)^T$ (e) $(B^T A^T + A^T B^T)$

4) Let A=$\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. Then adj (A^T) is equal to

(a) $(\text{adj } A)^T$ (b) $\begin{bmatrix} 1 & -6 \\ -6 & 16 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & -3 \\ -2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} -4 & 3 \\ 2 & -1 \end{bmatrix}$ (e) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

5) If *B* and *C* are respectively the adjoint and cofactor matrix of an invertible matrix A, which of the following is(are) necessarily true?

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

6) Consider the following system of $\boldsymbol{m}$ linear equations in $\boldsymbol{n}$ unknowns.

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

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 **homogeneous**, which of the following is(are) true about the system?

(a) The system is consistent.
(b) The system is inconsistent.
(c) $x_1 = x_2 = ... = x_n = 0$ is always a solution of the system.
(d) The system has only one solution.
(e) The system may have infinitely many solutions.

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

(a) I is a diagonal matrix.
(b) I is a symmetric matrix.
(c) I is not an upper triangular matrix.
(d) I is not a lower triangular matrix.
(e) $(I)^n = I$.

8) Let A = $\begin{bmatrix} 8 & 9 & 2 \\ 3 & 6 & 7 \\ 5 & 4 & 1 \end{bmatrix}$. Then | A | is equal to

(a) $\begin{vmatrix} 8 & 9 & 2 \\ 5 & 4 & 1 \\ 3 & 6 & 7 \end{vmatrix}$ (b) $\begin{vmatrix} 8 & 2 & 9 \\ 3 & 7 & 6 \\ 5 & 1 & 4 \end{vmatrix}$ (c) $\begin{vmatrix} 5 & 4 & 1 \\ 8 & 9 & 2 \\ 3 & 6 & 7 \end{vmatrix}$ (d) $\begin{vmatrix} 2 & 8 & 9 \\ 7 & 3 & 6 \\ 1 & 5 & 4 \end{vmatrix}$ (e) $\begin{vmatrix} 8 & 9 & 1 \\ 3 & 6 & 6 \\ 5 & 4 & 0 \end{vmatrix} + \begin{vmatrix} 8 & 9 & 1 \\ 3 & 6 & 1 \\ 5 & 4 & 1 \end{vmatrix}$

9) If $x_n + x_{n+1} = 1$ and $x_1 = 2$, then x_{100} is equal to

(a) 0 (b) 1 (c) -1
(d) -2 (e) 2

10) If the 3rd, 5th and 8th terms of a non-constant arithmetic progression are three consecutive terms respectively of a geometric progression, then what is the common ratio of the geometric progression?

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

11) If $x_n = \frac{1+n}{1-n}$, then for large n, x_n will approach

(a) 1	(b) 0	(c) ∞
(d) -1	(e) $-\infty$	

12) A quadrilateral *ABCD* is a parallelogram if

(a) $AB = CD$	(b) $\overrightarrow{AB} = \overrightarrow{BC}$	(c) $\overrightarrow{AB} = \overrightarrow{DC}$
(d) $\overrightarrow{AB} = \overrightarrow{BD}$	(e) $\overrightarrow{AD} = 2\,\overrightarrow{BC}$	

13) If *OABC* is a rhombus then which of the following is/are true?

(a) $\overrightarrow{AB} = \overrightarrow{OC}$	(b) $\overrightarrow{OA} + \overrightarrow{AB} = \overrightarrow{OB}$	(c) $\overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{CB}$
(d) $\overrightarrow{OA} + \overrightarrow{AB} = \overrightarrow{OC} + \overrightarrow{CA} + \overrightarrow{AB}$	(e) $\overrightarrow{AC} = \overrightarrow{BC}$	

14) If $\underline{x} = a\mathbf{i} + b\mathbf{j} + \mathbf{k}$, $\underline{y} = \mathbf{i} + b\mathbf{j} + c\mathbf{k}$ and $z = a\mathbf{i} + \mathbf{j} + c\mathbf{k}$, where a, b, c are positive integers and $\underline{x} \perp (z - \underline{y})$, then

(a) a+b=0	(b) a+2b=0	(c) a-2b=0
(d) 2a+b=0	(e) a-b=0	

15) The area bounded by the curves x = 0, y = 0, x = 1 and y = $3 + e^{-x}$ is

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

16) $\int_{-a}^{a} x^5 \, dx$ is equal to

(a) $2a^5$	(b) $2a^6$	(c) $\frac{a^6}{3}$
(d) 0	(e) $-2a^6$	

17) The second derivative of $f(x) = \sin(2x) + \cos(3x)$ is

(a) $4\sin(2x)$ -9cos(3x) (b) $2\sin(2x)$ -3cos(3x) (c) $-2\sin(2x)$ -3cos(3x)
(d) $-4\sin(2x)$ -9cos(3x) (e) $-4\sin(2x)$ +9cos(3x)

18) If $f(x) = cosx - sinx$ then the 29th derivative of $f(x)$ is

(a) $2sinx - 2cosx$ (b) $-sinx - cosx$ (c) $-2sinx + 2cosx$
(d) $sinx - cosx$ (e) $-sinx + cosx$

19) If $I_n = \int x^n e^x dx$ for n ∈ N, then I_{n-1} is equal to

(a) $I_{n-1} = \frac{x^n e^x - I_n}{n}$ (b) $I_{n-1} = \frac{x^n e^x + I_n}{n}$ (c) $I_{n-1} = \frac{x^{n-1} e^x - I_n}{n}$
(d) $I_{n-1} = \frac{x^{n-1} e^x + I_n}{n}$ (e) $I_{n-1} = \frac{-x^n e^x + I_n}{n}$

20) If $f(x) = \ln(2 - \cos x), x \in R$ then $f'(x) = 0$ has

(a) only 1 solution. (b) finitely many solutions. (c) infinitely many solutions.
(d) no solutions. (e) 3 solutions.

21) Consider the following random variables.

I. Your BIT identity card number
II. Your island rank at the G.C.E. (A/L) examination
III. The time taken to complete a single transaction by a customer at an ATM.

The type of each random variable is;

(a) I : Numerical, II: Categorical, III: Categorical
(b) I : Numerical, II: Numerical, III: Categorical
(c) I : Numerical, II: Categorical, III: Numerical
(d) I : Categorical, II: Categorical, III: Numerical
(e) I : Categorical, II: Numerical, III: Numerical

22) The standard deviation of a binomial distribution with a probability of success 0.2 is 1.6. What is the expected value of this distribution?

(a) 0.16 (b) 0.5 (c) 1.6
(d) 2.0 (e) 3.2

23) If the variance of a Poisson distribution is 9 then its mean is

(a) 3 (b) 4.5 (c) 9
(d) 18 (e) 81

24) Suppose 90% of all hard disks received from a certain supplier does not have bad sectors. A random sample of 10 hard disks is tested for bad sectors and the number of hard disks with bad sectors in the sample is recorded. Then “X: number of hard disks with bad sectors in the sample” has a

(a) binomial distribution with parameters n = 10 and p =0.9
(b) binomial distribution with parameters n = 10 and p =0.1
(c) exponential distribution with parameter $\lambda = 0.9$
(d) poisson distribution with parameter $\lambda = 0.9$
(e) poisson distribution with parameter $\lambda = 9$

25) The distribution of resistance for resistors of a certain type is known to be normally distributed with mean 6 ohms and standard deviation 2 ohms. Let F(X) be the cumulative distribution function of a normally distributed random variable. Then $P(4 \leq X < 7)$ will be;

(a) F(4) - F(7) (b) F(4) - F(6) (c) F(7) - F(4)
(d) F(6) - F(4) (e) F(3) - F(7)

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