

**BACHELOR IN COMPUTER  
APPLICATIONS****Term-End Examination****December, 2008****CS-60 : FOUNDATION COURSE IN  
MATHEMATICS IN COMPUTING**

Time : 3 hours

Maximum Marks : 75

**Note :** Question No. 1 is **compulsory**. Attempt any **three** questions from Questions No. 2 to 6.  
Use of calculator is permitted.

1. (a) Fill in the blanks : 3
- (i) By commutativity of '.' in real numbers, we get  $x \cdot y = \dots\dots\dots$   
where  $x$  and  $y$  are real numbers.
- (ii) By associative property of '.' in real numbers, we get  
 $(x \cdot y) \cdot z = \dots\dots\dots$  ,  
for real numbers  $x$ ,  $y$  and  $z$ .
- (iii) For real numbers  $x$ ,  $y$  and  $z$ , then using transitivity of '>' in  $\mathbb{R}$ , we get  
If  $x > y$  and  $y > z$  then  $\dots\dots\dots$  .

(b) For real numbers  $x$  and  $y$ , tell for each of the following, whether it is *True* or *False* : 3

(i)  $|x + y|$  always equals  $|x| + |y|$

(ii)  $|x \cdot y|$  always equals  $|x| \cdot |y|$

(iii)  $|x - y|$  always equals  $|x| - |y|$ ,

where  $|x|$  = absolute value of  $x$ .

(c) In each of the following, if  $f : \mathbb{R} \setminus \{0\} \rightarrow \mathbb{R}$  is a function and is defined as 3

(i)  $f(x) = 5x$ , then tell whether  $f$  is 1-1 or not and why.

(ii)  $f(x) = 2x^4$ , then tell whether  $f$  is 1-1 or not and why.

(iii)  $f(x) = 2/x^2$ , then tell whether  $f$  is onto or not and why.

(d) Given :  $f : \mathbb{R} \rightarrow \mathbb{R}$  and  $g : \mathbb{R} \rightarrow \mathbb{R}$  are two functions such that

$$f(x) = 2x^3 \text{ and } g(x) = 7x + 5,$$

then find  $f \circ g$  and  $g \circ f$ . 3

(e) Find  $dy/dx$  for each of the following : 3

(i)  $y = 3 \sin x$

(ii)  $y = 17 + 5x$

(iii)  $y = x^6$

(f) Evaluate each of the following : 3

(i)  $\int (3 + x^4) dx$

(ii)  $\int \sin x dx$

(iii)  $\int 7 dx$

(g) Evaluate each of the following : 3

(i)  $\int_2^3 (7 + 8x) dx$

(ii)  $\int_1^2 e^{5x} dx$

(iii)  $\int_0^{\pi/2} \cos x dx$

(h) Solve the following system of linear equations : 3

$$5x + 4y = 14$$

$$3x + 7y = 13$$

(i) Find the value of the determinant 3

$$\begin{vmatrix} 2 & 3 & 6 \\ 4 & 1 & 12 \\ 3 & 2 & 9 \end{vmatrix}$$

- (j) Find the arithmetic mean of the following numbers : 3

8, 15, 10, 12, 6

- (k) Find the geometric mean of the following numbers : 3

2, 4, 8, 64

- (l) For each of the following, tell whether it is true or false, where A, B and C are sets and  $\cup$ ,  $\cap$  denote respectively set union and set intersection : 3

(i)  $A \cup B$  always equals  $B \cap A$

(ii)  $(A \cup B) \cup C = A \cup (B \cup C)$

(iii)  $A \cap \phi = A$ , where  $\phi$  denotes empty set.

- (m) Draw a Venn diagram for sets A and B with universal set U such that A is a subset of B. 3

2. (a) State the following properties/laws of real numbers : 4

(i) Associative property of '+' in real numbers

(ii) Distributivity of '.' over '+' in R

(iii) Archimedean property

(iv) Monotone property of '+' in R

(b) Draw a graph for each of the following functions : 4

(i)  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that

$$f(x) = 7 \text{ for all } x \text{ in } \mathbb{R}$$

(ii)  $f : \mathbb{R} \rightarrow \mathbb{R}$  such that

$$f(x) = 2x + 3 \text{ for all } x \text{ in } \mathbb{R}$$

(c) Define each of the following concepts and give an example for each : 4

(i) Odd function

(ii) Composition of two functions

3. (a) Evaluate the following : 4

(i)  $\int_0^{\pi} (x - \sin x) dx$

(ii)  $\int \frac{2}{3(1+x^2)} dx$

(b) For each of the following functions, find whether the function is monotonically increasing or monotonically decreasing or neither, on given interval : 4

(i)  $f(x) = x^2 - 1$  on  $[0, 2]$

(ii)  $f(x) = \cos x$  on  $[0, \pi/2]$

- (c) Prove the following inequality : 2

$$e^x > 1 + x^2/2 + x^3/6$$

- (d) Find the area of the region bounded by 2

$$x = 0, \quad x = 3 \quad \text{and} \quad y = 3.$$

4. (a) Do as directed : 1+1+2

- (i) Describe the following set by listing method :

$$\{x \mid x \text{ is a divisor of } 36\}$$

- (ii) Describe the following by property method :

$$\{2, 4, 6, 8, \dots\}$$

- (iii) Show the following for any set A

$$\phi \subseteq A,$$

where  $\phi$  denotes empty set.

- (b) Obtain conjugate of each of the following complex numbers : 3

(i)  $3 + 5i$

(ii)  $8i$

(iii)  $12$

- (c) Explain the following with suitable example : 5
- (i) Proof by counter-example
  - (ii) Proof by contradiction

5. (a) Solve the following : 6

$$x + 2y + 3z = 10$$

$$2x + y + 2z = 10$$

$$3x + 4y + z = 18$$

- (b) Find the value of the following determinant : 3

$$\begin{vmatrix} 1 & 2 & 3 \\ 1 & 2 & 4 \\ 3 & 1 & 2 \end{vmatrix}$$

- (c) Explain each of the following concepts with one suitable example for each : 3

(i) Harmonic Mean

(ii) Arithmetic Mean

(iii) Geometric Mean

6. (a) Find the mid point of the straight line joining the line segment A (2, 3) and B (-5, 7). 2

- (b) Find the equation of the straight line parallel to the line  $2y + 3x + 1 = 0$  and passing through the point (0, 0). 3

- (c) Find the equations of a straight line in three-dimensional space joining the points  $(-1, 0, 1)$  and  $(2, 1, 4)$ . 3
- (d) Let  $A(0, 2, 6)$ ,  $B(3, -4, 7)$ ,  $C(6, 3, 2)$  and  $D(5, 1, 4)$  be four points in three-dimensional space. Find the projection of the line  $AB$  on  $CD$ . 4