

BCA 1st Semester Exam., 2013

BASIC MATHEMATICS

Time : 3 hours

Full Marks : 60

Instructions:

- (i) The questions are of equal value.
 (ii) There are **SEVEN** questions in this paper.
 (iii) Attempt **FIVE** questions in all.
 (iv) Question Nos. 1 and 2 are compulsory.

1. Answer any six of the following questions as directed :

- (a) If sets A and B have n elements in common, then how many elements do $A \times B$ and $B \times A$ have in common?
 (b) If $A = \{1, 2, 3, 4\}$, then show that the relation $R = \{(1, 2), (2, 3), (1, 3), (1, 4), (4, 2)\}$ is not a transitive relation on A .
 (c) If the truth values of the statements p and q be T and F respectively, then which of the following propositions has the truth value T ?

- (i) $p \wedge q$
 (ii) $\sim p \vee q$
 (iii) $p \wedge (\sim q \vee q)$
 (iv) $p \Rightarrow q$

(Choose the correct one)

- (d) Which of the following is equivalent to the negation of $p \vee q$?

(i) $\sim p \vee q$

(ii) $p \Rightarrow q$

(iii) $\sim p \wedge (\sim q)$

(iv) $\sim p \vee (\sim q)$

(Choose the correct one)

- (e) If $u = \log(x^3 + y^3 + z^3 - 3xyz)$, then which of the following is the value of $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z}$?

(i) $\frac{3(x^2 + y^2 + z^2)}{x^3 + y^3 + z^3 - 3xyz}$

(ii) $\frac{3(x^2 + y^2 + z^2 - 3xyz)}{x^3 + y^3 + z^3 - 3xyz}$

(iii) $\frac{3}{x + y + z}$

- (iv) None of the above

(Choose the correct one)

- (f) When does the function $f(x) = \sin 3x - 3 \sin x$ attain its maximum or minimum values in $(0, \pi)$?

(g) If $f(x) = f(a \pm x)$, then $\int_0^{na} f(x)dx$ is equal to

(i) $\int_0^a f(x)dx$

(ii) $n \int_0^a f(x)dx$

(iii) $n \int_0^{na} f(x)dx$

(iv) None of the above

(Choose the correct one)

(h) Write down the formula for finding the area bounded by the curve $r = f(\theta)$ and two radii vectors $\theta = \alpha$ and $\theta = \beta$.

(i) Find the angle between the lines $3x + y - 8 = 0$ and $x + 2y + 2 = 0$.

(j) Find the centre and radius of the circle $x^2 + y^2 - 2x - 6y - 6 = 0$.

2. Answer any three of the following :

(a) Prove that $A \times (B \cup C) = (A \times B) \cup (A \times C)$ where A , B and C are three sets.

(b) If p is a statement, then show that $\sim (p \vee \sim p)$ is a contradiction.

(c) Find the radius of curvature at any point (x, y) of the parabola $y^2 = 4ax$.

(d) Find the area bounded by the parabolas $x^2 = 4y$ and $y^2 = 4x$.