S–262(A to C)

B. Sc. (Third Semester)
EXAMINATION, 2018-19
(Skill Enhancement Course)
COMPUTER SCIENCE

Time : Two Hours] [*Maximum Marks : 70*

S–262(A)

(Logic and Sets)
[SOS/C. S./SEC–001(A)]

Note : (i) Attempt any *five* questions from Section A and any *three* questions from Section B.

(ii) Answer each question of Section A within 50 words.

(iii) Limit your answers within the given answer book. Additional answer book (B-Answer book) should not be provided or used.

Section—A

Note : Attempt any *five* questions. Each question carries 5 marks.

1. Construct the truth table for :

$$(p \to q) \to [p \vee \sim q] \to (p \vee q)$$

2. Show that the following statement is a tautology :

$$[p \wedge (p \to q)] \to q$$

3. Obtain the disjunctive normal form of the following :

$$p \Rightarrow (p \Rightarrow q) \wedge \sim (\sim q \vee \sim p)$$

4. Define set and subset. Write all the subsets of the set.

$$A = \{1, 2, 3, 4, 6\}$$

5. Discuss function and mapping with some suitable examples.

6. Define Venn-Diagram and using Venn-Diagram prove that :

$$(A \cap B)' = A' \cup B'$$

7. Use the principle of Mathematical induction prove that :

$$1 + 2 + 3 + 4 + 5 + \ldots\ldots + n = n(n + 1)/2$$

Section—B

Note : Attempt any *three* questions. Each question carries 15 marks.

8. Define the following with examples :

(i) Multiple quantifiers

(ii) Logical equivalence

(iii) Conditional proposition

9. If A, B and C be the three finite sets, then prove that :

$$|A \cup B \cup C| = |A| + |B| + |C| - |A \cap B| - |B \cap C| - |C \cap A| + |A \cap B \cap C|$$

10. Define equivalence relation. If R and S are two equivalence relations on a set A, the $R \cap S$ is also an equivalence relation on A.
11. Define the following with an example.
    (i) Cross product of two and three sets
    (ii) Composition relation
    (iii) Use of Venn-Diagram in Logic
12. If A , B and C are any *three* non-emply sets, then prove that :

$$A \times (B \cap C) = (A \times B) \cap (A \times C)$$

13. Write short notes on any *two* of the following :
    (i) Bioconditional proposition
    (ii) Predicate and quantifiers
    (iii) Binding variables and negations

S–262(B)

(Analytical Geometry)

[SOS/C. S./SEC–001(B)]

Note : (i) Attempt any *five* questions from Section A and any *three* questions from Section B.

(ii) Answer each question of Section A within 50 words.

(iii) Limit your answers within the given answer book. Additional answer book (B-Answer book) should not be provided or used.

Section—A

Note : Attempt any *five* questions. Each question carries 5 marks.

1. Find the angle between the lines whose direction cosines are given by the equations $l + m + n = 0$ and $l^2 + m^2 - n^2 = 0$.
2. Find the condition that the straight line $lx + my + nz = 0$ may touch the circle $x^2 + y^2 = a^2$.
3. Find the equation of the tangent to the parabola at the point (X_1, Y_1).
4. Find the condition so that the line $x \cos \alpha + y \sin \alpha = p$ may be normal to the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$.
5. Discuss asymptotes. Find the asymptotes of a hyperbola.
6. Find the equation of the sphere passing through the points (0, 0, 0), (0, 1, –1), (–1, 2, 0) and (1, 2, 3).
7. Find the equation of right circular cylinder of radius 2 whose axis is the line $\frac{(x-1)}{2} = (y-2) = \frac{(z-3)}{2}$.

Section—B

Note : Attempt any *three* questions. Each question carries 15 marks.

8. Trace the conic :

$$3x^2 - y^2 + 4zx - 10x + 2y - 4z + 6 = 0$$

9. Trace the hyperbola :

$$32x^2 + 52xy - 7y^2 - 64x - 52y - 158 = 0$$

10. Find the equation of the sphere which passes through the four points (0, 0, 0), (0, 1, –1), (–1, 2, 0) and (1, 2, 3).

11. Trace the parabola :

$$16x^2 - 24xy + 9y^2 - 104x - 172y + 44 = 0$$

12. Find the angle between the line $\frac{x+1}{2} = \frac{y}{3} = \frac{z-3}{6}$ and the plane $3x + y + z = 7$.

S–262(C)

(Number Theory)

[SOS/C. S./SEC–001(C)]

Note : (i) Attempt any *five* questions from Section A and any *three* questions from Section B.

(ii) Answer each question of Section A within 50 words.

(iii) Limit your answers within the given answer book. Additional answer book (B-Answer book) should not be provided or used.

Section—A

Note : Attempt any *five* questions. Each question carries 5 marks.

1. If $a = -427, b = 616$ then find gcd (a, b) and express it in the form $ax + by$ where x, y are some integers.

2. If two integers m and n are relatively prime then prove that $m \mid np \Rightarrow m \mid p$, p is an integer.

3. Prove that number of positive primes is infinite.

4. If gcd $(m, n) = 1$, then show that gcd $(m^2, n^2) = 1$.

5. Solve the following congruenece :

$13x \equiv 9 \pmod{25}$, x, y are integers.

6. Find the number of positive integers < 3600 that are relatively prime to 3600.

7. If gcd $(n, 7) = 1$, then prove that $n^{12} - 1$ is divisible by 7.

Section—B

Note : Attempt any *three* questions. Each question carries 15 marks.

8. Determine all solutions in the integers of the equation :

$$221x + 35y = 11$$

9. Prove that the product of n conseutive natural numbers is divisible by $n!$

10. If p is a positive prime and a, b are integers, then prove that $(a + b)^p = a^p + b^p + M(p)$ where M (p) means a multiple of p.

11. If a and b are two integers, then prove that $a \equiv b \pmod{m}$ if and only if a and b have the same remainder when divided by m.

12. If p is prime, then prove that $n^p \equiv n \pmod{p}$ for every integer n.

13. Define the following with example :

    (a) Mobius inversion formula

    (b) Number theoretic function