

B.C.A. DEGREE EXAMINATION, NOVEMBER 2017
THIRD SEMESTER

COURSE : ALLIED – CORE
PAPER : MATHEMATICS FOR COMPUTER SCIENCE - I
TIME : 3 HOURS MAX. MARKS : 100

SECTION – A (10 X 2 = 20)
ANSWER ALL THE QUESTIONS

1. Show that $(P \rightarrow Q) \wedge (R \rightarrow Q)$ and $(P \vee R) \rightarrow Q$ are equivalent formulae.
2. Give the dual of the formula $P \uparrow (Q \wedge \neg(R \downarrow P) \wedge T)$.
3. Define equivalence relation.
4. Define lattice.
5. State the well ordering principle.
6. Define Euler – totient function.
7. Explain the terms plain text and cipher text.
8. Using the matrix $A = \begin{pmatrix} 2 & 3 \\ 1 & 8 \end{pmatrix} \in M_2(\mathbb{Z}/26\mathbb{Z})$, encipher the message unit NO.
9. Find the number of bytes.
10. State Binomial Theorem.

SECTION – B (5 X 8 = 40)
ANSWER ANY FIVE QUESTIONS

11. Establish that $[(P \vee Q) \wedge (P \rightarrow R) \wedge (Q \rightarrow R)] \Rightarrow R$.
12. Find a conjunctive normal form of $(P \wedge \neg(Q \vee R)) \vee (((P \wedge Q) \vee \neg R) \wedge P)$.
13. If $D(n)$ denote the lattice of all positive divisors of the integer n , draw the Hasse diagrams of $D(10), D(15), D(32), D(45)$.
14. State and prove Euclid's lemma.
15. Encipher the message "PAYMENOW" using the affine transformation with enciphering keys $a = 7, b = 12$.
16. How do you send a signature by RSA?
17. How many persons must be chosen in order that at least five of them will have birth days in the same calendar month?

SECTION – C
ANSWER ANY TWO QUESTIONS

(2 X 20 = 40)

18. a) Find the PDNF and PCNF for $(P \vee \neg(Q \vee R)) \vee (((P \wedge Q) \wedge \neg R) \wedge P)$.

b) Prove that $(L \times M, \wedge, \vee)$ is a lattice.

(10+10)

19. a) State and prove Fundamental theorem of arithmetic.

b) Solve the following system of simultaneous equations of congruence.

$$x + 3y \equiv 1 \pmod{26}$$

$$7x + 9y \equiv 1 \pmod{26}$$

(10+10)

20. a) Out of five Mathematicians and seven Engineers a committee consisting of two how many ways can this be done if

(i) Any Mathematician and any Engineer can be included.

(ii) One particular Engineer must be on the committee.

(iii) Two particular Mathematicians cannot be on the committee.

b) In any lattice prove that the operations \wedge and \vee are isotone.

c) Find the number of three digit even numbers with no repeated digits.

(8+8+4)

