STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted during the academic year 2015 – 2016 and thereafter)

SUBJECT CODE : 15MT/AC/MS35

B.C.A. DEGREE EXAMINATION, NOVEMBER 2019
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 $(P \to Q) \wedge (R \to Q)$ and $(P \vee R) \to Q$ are equivalent.
2. Define functionally complete set of connectives with an example.
3. Let $A = \{2, 3, 6, 12, 24, 36\}$ and the relation $\leq$ is defined as $a \leq b$ if a/b. Draw the Hasse diagram of $(A, \leq)$.
4. Prove that every meet – homomorphism is an order preserving map.
5. Prove that if a prime p does not divide 'a' then $(p, a) = 1$.
6. Write the Euclidean algorithm.
7. What do you mean by encryption and decryption?
8. Define Hash function and state its property.
9. 5 boys and 5 girls are to be arranged around a circular table for a discussion so that the boys and girls sit alternate. In how many ways can they be seated?
10. How many persons must be chosen in order that at least five of them will have birth days in the same calendar month?

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

11. Prove that $\neg(P \wedge Q) \to (\neg P \vee (\neg P \vee Q)) \Longrightarrow (\neg P \vee Q)$.
12. In any lattice $(L, \leq)$, Prove that the operations $\vee$ and $\wedge$ are isotone.
13. Prove that for any two integers a and b, there is a common divisor d of a and b of the form $d = ax + by$, where x and y are integers. Moreover, every common divisor of a and b divides this d.
14. Find all solutions of x and y for the given system of simultaneous congruences
$x + 3y \equiv 1 (mod\ 26),\ 7x + 9y \equiv 1\ (mod\ 26)$.

15. Prove the following identities.

(i) $C(n+1,r) = C(n,r-1) + C(n,r)$.

(ii) $C(m+n,2) - C(m,2) - C(n,2) = mn$.

16. If $n \geq 1$, Prove that $\sum_{d/n} \varphi(d) = n$.

17. Define Ramsey number and prove that $R(3,3) = 6$.

SECTION – C **(2 X 20 = 40)**

ANSWER ANY TWO QUESTIONS

18. (a) Without constructing the truth table find the PDNF and PCNF of

$(\neg p \rightarrow r) \wedge (q \leftrightarrow p)$.

(b) Prove that every chain is a lattice. (10 + 10)

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

(b) State and prove the fundamental theorem of arithmetic. (10 + 10)

20. (a) (i) Explain briefly about Affine enciphering transformation.

(ii) In the 27-letter alphabet (with blank=26), use the affine enciphering transformation with key $a = 13, b = 9$ to encipher the message "HELP ME" . (4 + 6)

(b) (i) In how many ways can the letters of the word MISSISSIPPI be arranged? In how many of these arrangements, the P's are separated?

(ii) From 7 women and 9 men, a committee of 5 is to be formed. How many ways the selection can be made if at least one woman and one man must be on the committee. (6 + 4)

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