CBCS SCHEME

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18CS744

Seventh Semester B.E. Degree Examination, June/July 2023
Cryptography

Time: 3 hrs. Max. Marks: 100

Note: *Answer any FIVE full questions, choosing ONE full question from each module.*

Module-1

1 a. Give and explain the 3 independent dimensions of Cryptographic Systems. **(06 Marks)**

b. A message received at an Australian wireless station in play fair code : KXJEY UREBE key used was ROYAL NEW ZEALAND NAVY. Decrypt the message. **(08 Marks)**

c. In the One – time pad version of a Vignere Cipher , Key stream is 9 0 1 7 23 15 21 14 11 11 2 8 9. In this scheme, encryption is done by shifting with number mentioned in the key. Encrypt the plain text sendmoremoney and using the Cipher text obtained, find a key such that Cipher text decrypts to cashnotneeded. **(06 Marks)**

OR

2 a. Differentiate Confusion and Diffusion. With a structure, explain the working of Fiestel Encryption and Decryption. **(07 Marks)**

b. Encrypt the message "MAM" using Hill cipher with key

$$A = \begin{bmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{bmatrix}.$$

Further show the calculations for corresponding decryption of Cipher text to recover plain text. **(08 Marks)**

c. Given data – 208 amd IP = [4 1 8 2 3 5 6 7] (IP means Initial Permutation). Find the permutation of the data and its inverse. **(05 Marks)**

Module-2

3 a. Differentiate Public Key Encryption and Conventional Encryption. Classify and explain Public Key Cryptosystems. **(06 Marks)**

b. In a Public key system using RSA, you intercept the ciphertext C = 10 sent to a user where n = 221. What is the plaintext. **(07 Marks)**

c. "Diffie – Hellman key exchange is vulnerable to Man – in – The – middle attack" Substantiate with a sequence diagram. **(07 Marks)**

OR

4 a. Design Public key encryption system for secrecy and Authentication separately. **(06 Marks)**

b. Consider a Diffie – Hellman scheme with common prime, q = 11 and primitive root $\alpha = 2$.

i) Show that 2 is a primitive root of 11.

ii) If user has public key $Y_A = 9$, what is A's private key X_A.

iii) If user B has public key $Y_B = 3$, what is secret key K shared with A. **(07 Marks)**

c. Consider an Elgamal scheme with common prime q = 71 and primitive root $\alpha = 7$. If B has public key $Y_B = 3$ and A choose random integer K = 2, what is Cipher text of M = 30. If A now chooses different value of K, so that encoding of M = 30 is C = (59, C_2) what is C_2? **(07 Marks)**

Module-3

5 a. Give the Geometric and Algebraic description of Addition on Elliptic curves over real number. **(07 Marks)**

b. Prove that elliptic curve equation $y^2 = x^3 + 10x + 5$ does not defines group over Z_{11}. Consider elliptic curve E_{11} (1, 6) defined by $y^2 = x^3 + x + 6$ with modulus = 11. Determine all points in E_{11} (1, 6). **(09 Marks)**

c. Cryptosystem parameters $E_{11}(1, 6)$ and G = (2, 7). B's private key $n_B = 3$. Find B's Public key P_B. **(04 Marks)**

OR

6 a. Explain the working of Micali – Schnorr Pseudorandom Bit Generator. **(06 Marks)**

b. Define Control Vector. Explain the Coupling and Decoupling process with control vector. **(07 Marks)**

c. Consider an elliptic curve over $GF(2^4)$ with irreducible polynomial $f(x) = x^4 + x + 1$. Develop power of g, (generator with $g^4 = g + 1$) and check whether point (g^6, g^8) exists in this curve with equation $y^2 + xy = x^3 + g^4 x^2 + 1$. **(07 Marks)**

Module-4

7 a. Write and explain general format of X.509 certificate. **(08 Marks)**

b. With a figure, bring out the relationship among keyelements of PKIX model. **(07 Marks)**

c. With a sequence diagram, illustrate the Kerberos exchanges among the parties. **(05 Marks)**

OR

8 a. Consider one way authentication technique based on asymmetric encryption : $A \rightarrow B$: IDA $B \rightarrow A$: $E(PVa, R_2)$ $A \rightarrow B$: R_2. Explain the protocol and what type of attack this protocol is susceptible to? **(05 Marks)**

b. "PGP has grown explosively and is widely used". Enlist the reasons coated for this growth. **(05 Marks)**

c. Summarize the different cryptographic algorithms used in S/MIME with its function and requirement. Explain the motivating factors of DKIM and also illustrate deployment of DKIM with a simple example. **(10 Marks)**

Module-5

9 a. Depict and explain IPSec Architecture. Explain the parameters required for Security Association. **(10 Marks)**

b. Write the top level format of an ESP packet and explain the fields. Differentiate Transport and Tunnel mode of Encryption. **(10 Marks)**

OR

10 Write short notes on :

a. Protocol Operation for ESP.

b. Basic Combinations of Security Associations.

c. Features of key Determination in IKE.

d. Cryptographic suites. **(20 Marks)**

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