

T2 Examination, ODD 2023
B.Tech (5th Semester)

Course Title: Computer Networks and Security
Course Code: 18B11CS212

Maximum Time: 1 hour
Maximum Marks: 20

CO1	Explain the fundamental concepts of computer network and security.
CO2	Interpret data link layer protocols for multiple access communication, error detection and correction problems.
CO3	Identify the application of number theory in the cryptographic algorithms.
CO4	Identify suitable transport layer protocol along with its security solutions
CO5	Examine internet protocol (IP), routing principles, and IPsec architecture.

Note: Attempt all questions. For numerical problems show the necessary steps.

Q1. State the key idea of distance vector routing algorithm. Calculate the new (at t=1) distance vector for router b (D_b) after processing the received distance vectors from routers a, c, and e.

(D_b): $D_b(a) = 8, D_b(b) = 0, D_b(c) = 1, D_b(d) = \infty, D_b(e) = 1, D_b(f) = \infty, D_b(g) = \infty, D_b(h) = \infty, D_b(i) = \infty;$

(D_a): $D_a(a) = 0, D_a(b) = 8, D_a(c) = \infty, D_a(d) = 1, D_a(e) = \infty, D_a(f) = \infty, D_a(g) = \infty, D_a(h) = \infty, D_a(i) = \infty;$

(D_c): $D_c(a) = \infty, D_c(b) = 1, D_c(c) = 0, D_c(d) = \infty, D_c(e) = \infty, D_c(f) = \infty, D_c(g) = \infty, D_c(h) = \infty, D_c(i) = \infty;$

(D_e): $D_e(a) = \infty, D_e(b) = 1, D_e(c) = \infty, D_e(d) = 1, D_e(e) = 0, D_e(f) = 1, D_e(g) = \infty, D_e(h) = 1, D_e(i) = \infty;$

[CO5 (Analyzing), 2+2M]

Q2. Compare and contrast the header structure of IPv4 and IPv6. Discuss the main fields present in each protocol's header. What strategies have been developed to facilitate the transition from IPv4 to IPv6. Write name of strategy and its working principle (within two lines for each).

[CO5 (Analyzing), 3+2M]

Q3. How CSMA/CD and CSMA/CA handle collision. The data rate is 10 Mbps, the distance between station A and C is 2200m, and propagation speed is 2×10^8 m/s. Station A starts sending a long frame at $t_1=0$; station C starts sending a long frame at $t_2=3 \mu s$. Find: (a) The time when C hears the collision. (b) The time when A hears the collision. (c) Number of bits A has sent before detecting the collision. (d) Number of bits C has sent before detecting collision.

[CO2 (Understanding), 2+2M]

Q4. How to compute codeword and syndrome for Hamming code C (7,4). Given the data word 1010011110 and the divisor 10111. Generate the codeword at the sender using CRC Polynomial. *add 3 extra bits.*

[CO2 (Understanding), 1+3M]

Q5. How authentication header (AH) protocol provides security in IPsec and how it differs with encapsulating security payload (ESP) protocol.

[CO5 (Analyzing), 2M]

Q6. 100 stations on a pure aloha network share a 1-Mbps channel. If frames are 2000 bits long, find the throughput if each station is sending 10 frames per second.

[CO2 (Understanding), 1M]

Jaypee Institute of Information Technology, Noida
T2, Examination, 2023
B.Tech 5th Semester

Course Title: Financial Management
Course Code: 16B1NHS433

Maximum Time: 1 Hour
Maximum Marks: 20

Course outcomes- After studying this course the students will be able to-

CO1: Understand the fundamental concepts of financial management and its various dimensions

CO2: Apply the knowledge of the time value of money, capital budgeting techniques and cost of capital in taking long term investment decisions

CO3: Analyze the leverage capacity of a business and apply it in selection of long-term sources of finance

CO4: Evaluate the financial performance of a business through financial statements.

Note: Answer all questions in the given order.

Q.1 DLF Estate Ltd. provided some information related to a newly started project. On the basis of given information calculate the missing values: [5 marks, CO2, Apply level]

Operating annual cash flows	Rs 80,000	Life of the project	4 years
Salvage value	0	Internal rate of return of the project	15%
Profitability index	1.064	Initial Investment	?
Payback period	?	Net Present Value	?

Q.2 Lotus Corporation is contemplating replacing its existing milling machine with an improved version that would increase the production from 12000 components per year to 18000. Due to its improved design, the new component would fetch a better price of Rs 90 as against the existing price of Rs 80 each.

The new machine would cost Rs 11 lakhs. For setup of the new machine, a bigger factory space will be utilized which is currently rented out for Rs 1 lakh per year. The machine will also use a cutting tool worth Rs 50,000 which is currently lying idle. The machine will be depreciated on a written-down value basis at a 30% depreciation rate for 3 years and can be sold for Rs 4.5 lakhs after 3 years. Due to the new machine, the operator's salary would have to be increased from Rs 50,000 to Rs 70,000 per month. There would be no change in any other cost.

If replaced now, the existing milling machine would be sold for Rs 3.5 lakhs which has a book value of Rs 3 lakhs. The remaining life of the existing machine is 3 years and is being depreciated at Rs 1 lakh per year. The existing machine will have no salvage value after 3 years.

Assume 30% taxes on income and capital gains. If the cost of capital is 10% examine whether the Lotus Corporation should replace the machine or not? [9 marks, CO2, Apply level]

Q.3 Compare and contrast the following:

[2x3= 6 marks, CO3, Analyze level]

a) Sole proprietorship and Company form of business

b) Partnership and Limited liability partnership forms of business

c) Retained earnings and Debenture capital as sources of long-term capital

CO1	Demonstrate an understanding about the early Indian traditional political thought and the current Indian political scenario by knowing about the structure of government in place.
CO2	Demonstrate an understanding of the role of Indian President, Prime Minister, Governor, other members of the legislature and local governments as representatives of the common masses
CO3	Analyze the working of Indian federalism with reference to centre-state relations
CO4	Analyze the impact of the contemporary challenges such as caste and gender to the working of Indian democracy

Note: Attempt all the questions.

- Q1. Distinguish between the real and the nominal executive heads of the country. Substantiate your answer by examining the powers and functions of the Prime Minister and the President of India. [CO2 (Understanding), 5 Marks]
- Q2. The Governor is the '*linchpin of the Constitutional apparatus of the state*', reported the Sarkaria Commission in 1998. His role '*has emerged as one of the key issues in Union-State relations*'. Do you agree with the above statement? Substantiate your answer with relevant provisions from the constitution of India. [CO2 (Understanding), 4 Marks]
- Q3 ✓ Classify the different stages in the legislative procedure in the Parliament related to the passing of ordinary bills and money bill. [CO2 (Understanding), 4 Marks]
- Q4 ✓ Explain the grounds on which a Judge of the Supreme Court of India can be removed, as outlined in the Constitution of India? [CO2 (Understanding), 4 Marks]
- Q5. Briefly explain the following: [CO2 (Understanding), 3 Marks]
- (i) Adjournment Sine Die
 (ii) No Confidence Motion

Course Title: Fundamentals of Computer Security
Course Code: 20B12CS332

Maximum Time: 1 Hr
Maximum Marks: 20

After Completion this course, students will be able to

C01	Explain the fundamental Concepts of computer security, malicious code and its effects
CO2	Describe various authentication and access control paradigms
CO3	Apply various preventive measures and techniques used to obtain secure system
CO4	Examine various security parameters from the perspective of legal and ethical issues

Important Instruction: Attempt all questions.

Q 1. Answer in one word/line for the given questions:

- a) The one-time pad is considered to be unconditionally secure. Why?
- b) If cryptanalyst knows only the encryption algorithm being used, ciphertext, and plaintext chosen by the cryptanalyst together with its corresponding encrypted ciphertext, then an attack can be classified as what type?
- c) Which concept aims to reduce the statistical nature of input plaintext in the output ciphertext of a block cipher?
- d) What are the four attacks suffered by Wi-Fi System?
- e) List two methods which can be used to authenticate a person based on his behaviour.

[CO3 (understand) 5 marks]

Q2. In a network with 100 hosts where each host runs 3 network applications (WhatsApp, Google meet and a File sharing application). Each application should be able to communicate with the corresponding application on any other host. If the data communication is encrypted using symmetric key cryptography, explain:

- a) How many host level (each host communicating to other host) session keys are required?
- b) If each application is communicating using every other corresponding application in the network, how many session keys shall be required?

[CO3 (Apply) 3 marks]

Q3. Explain how Access Control Lists are used to represent access control matrices. Describe the environments in which they are widely used and their advantages and disadvantages.

[CO2(Understanding) 4 marks]

Q4. Suppose the following groups are defined to shorten a system's access control list:-

Group 1: Alice, Bob, Cynthia, David, Eve

Group 2: Alice, Bob, Cynthia

Group 3: Bob, Cynthia

Suppose the access control list for File 1 is:- File1:{ Group 1,R; Group 2, RW }.

Suppose the access control list for File 1 is:- File1:{ Group 1,R; Group 2, RW }.

If Alice wants to write to File 1, will Alice be allowed to do so? Why?

[CO2(Understanding) 3 marks]

Q5. In a Défense exhibition, there were 150 male and 170 female visitors. The entry to the exhibition hall was through fingerprint-based verification system. The machine permitted 190 persons to enter the hall. Later, it was observed that 40 persons were rejected even though they had correct samples stored in the database and 30 kids entered had no samples registered and 10 imposters were stopped at the entry.

- a) How much sensitive the machine is under this scenario?
- b) To what extent the machine was specific in denying wrong entries?
- c) If the machine giving 80% accurate results is considered as reliable, comment about the reliability of this machine.

[CO2(Apply) 4 marks]

Jaypee Institute of Information Technology, Noida
Test-2 Examination, 2023
B.Tech. V Semester

Course Title: Laser Technology and Applications
Course Code: 16B1NPH533

Maximum Time: 1 Hr.
Maximum Marks: 20

CO1	Defining the properties and principle of lasers
CO2	Understanding of various applications of lasers
CO3	Ability to apply the concepts of standard techniques for the pulsed operation of laser and stability of laser resonator
CO4	Analysis of types of lasers

Note: Attempt all the questions sequentially

Q1. [CO2 (Understanding) (4×2=8 Marks)]

- (a) Plot and compare the normalized line shape functions for homogeneous and inhomogeneous broadening together. Also, write the names of the respective profiles.
- (b) Draw the intensity plots and beam patterns of TEM_{11} and TEM_{02} modes of a stable resonator.
- (c) Describe briefly the three necessary steps (in sequence) to select a single transverse mode and a single longitudinal mode of oscillation.
- (d) The half-width of the gain profile of a He-Ne laser ($\lambda = 632.8 \text{ nm}$) material is about $2 \times 10^{-3} \text{ nm}$. What should be the maximum length of the cavity in order to have a single longitudinal mode oscillation?

Q.2 [CO4 (Analyzing) (3×4=12 Marks)]

- (a) For a closed laser cavity (sides a, b, d), show that the relationship between expressions of longitudinal and transverse mode separations is, $\Delta v_m = \Delta v_q \frac{\lambda d}{2a^2} \left(m + \frac{1}{2} \right)$. Symbols used have their usual meanings.
- Further, if cavity mirrors having reflectivities 98% each, dimensions $3 \text{ cm} \times 3 \text{ cm}$ are separated by a distance of 60 cm, determine the longitudinal mode separation Δv_3 and transverse mode separation Δv_2 for 600 nm wavelength.
- (b) In absence of loss coefficient, calculate the FWHM of frequency spectrum for GaAs laser material of length 0.5 mm and refractive index 3.8. Reflectivity of a surface can be calculated as $[(n-1)/(n+1)]^2$.
- (c) What is the maximum Q-switched power output from a ruby laser ($\lambda = 694.3 \text{ nm}$) with a chromium concentration of 1.6×10^{25} chromium ions per cubic meter? Assume a ruby laser rod (cavity length) is 0.4 m and mirrors coated with a reflectivity of 90%. The index of refraction for ruby is 1.75. Assume also that the diameter of the multi-mode laser mode volume within the rod is approximately 2 mm. Determine the Q-switched power output from the laser if it is pumped to a factor of 11 times the threshold inversion density.

Course Title: Operating Systems and Systems Programming Maximum Time: 1 Hour
Course Code: 15B11CI412 Maximum Marks: 20

CO1	Explain the fundamental concepts along with the various components of operating system and system programming
CO2	Apply various OS scheduling techniques and algorithm for processes and threads
CO3	Elaborate the various resource management techniques of operating systems and their performance
CO4	Omit the concept of IPC and describe various process synchronization techniques in OS
CO5	Compare various disk scheduling algorithms and utilize I/O management techniques
CO6	Analyze the appropriate OS design choices when building real world systems

Note: Attempt all the questions

Q1. [Evaluate Level, (CO 3), 2 Marks] Suppose there are 1000 processes and 400 resources. These processes and resources are present on 200 different machine/nodes across multiple global geographical locations. In such a scenario, which deadlock handling technique suites best? Justify your statement with proper logic.

Q2. [Evaluate Level, (CO 3), 3 Marks] A System has four resource types, namely R_1, R_2, R_3, R_4 with instances 5,3,5, and 3 respectively. Five processes with a maximum resource claim for these resources are: $P_1(2,2,1,1)$, $P_2(1,2,1,2)$, $P_3(1,1,2,1)$, $P_4(3,1,2,0)$, $P_5(2,1,1,0)$. The resource allocations are P_1 with $(1,1,0,0)$, P_2 with $(0,1,1,0)$, P_3 with $(1,0,1,1)$, P_4 with $(2,1,2,0)$, and P_5 with $(1,0,1,0)$

- a. Determine weather the system will be in a safe state or not? Justify your statement.
- b. To change the system state of part (a), i.e., if it was in SAFE state, then it is to be changed to UNSAFE state and vice versa. Find out the minimum number of resource type(s) and their instance(s) that are required to be appended to change the state of part(a).

Q3. [Understand Level, (CO 4), 4 Marks] Investigate the Reader-Writer problem and explain the approach that satisfies the fairness (in terms of bounded waiting and starvation), Further, you need to write the code to implement Reader-Writer problem with fairness capabilities.

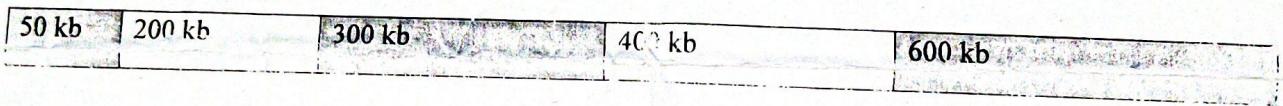
Q4. [Understand Level, (CO 4), 4 Marks] Consider three concurrent processes P_1 , P_2 , P_3 , as shown below, which access a shared variable A that has been initialized to 100.

P_1	P_2	P_3
$A = A + 20$	$A = A - 50$	$A = A + 10$

The processes are executed on a uniprocessor system running a time-shared operating system. If the minimum and maximum possible values of A after the three processes have completed execution are X and Y respectively, then the value of $X + Y$ _____.

Note: Increment or decrement operations on A will be executed in three instructions i.e., load, increment/decrement, and then store.

Q5. [Apply Level, (CO 5), 2 Marks] Consider the following heap, which show the free space and hatched region are in use



The sequence of requests for blocks of size 300 kb, 50 kb, 150 kb, 100 kb can be satisfied if we use.

- a. Either first fit or best fit policy
- b. First fit but not best fit policy
- c. Best fit but not first fit policy
- d. None of the above

Explain your answer.

Q6. [Apply Level, (CO 5), 5 Marks] A byte addressable system with the following specifications are given for memory management:

- a. Logical Address is defined by 64 bits long binary number.
- b. Physical address space is given as 128 MB.
- c. The available page size in logical address space is given as 8 KB

Calculate total size of the page table for efficient memory management where only single level paging is used.