BYJU'S EXAM PREP

Computer Science & IT

DRDO Scientist B PYQ

2020 Paper 2

DRDO Scientist B PYQ

1. A. What is the purpose of binary semaphore in operating system. Write two operations associated with updating the value of semaphore.

   B. Write a C program illustrating memory leak and also mention how to fix it.

   C. Using diagrams, explain two most commonly used hypervisor architecture to create virtual machines.

   D. Consider following processes with their arrival time, burst time and priority.

Process	Arrival time	Burst time	Priority
p0	1	7	1
p1	0	10	2
p2	1	5	3
p3	2	4	5
p4	3	6	4

   Find turn around time and wait for each process in following scheduling strategies: (a) nonpremptive scheduling, (b) RR (quantum = 1)

   Note: Smaller number means higher priority.

2. A. Write SOL queries for following:

   i. Create a new table A with fields TransactionID, UserID and DateOfTransaction.

   ii. Crete a new table B with UserID, UserName and ContantNo.

   iii. Select records having same/matching UserID in both tables.

   iv. Select records having all UserID values from both tables.

   B. Is the Table given below in First Normal Form? If not, then convert and show it. Is the resulting table in Second Normal From? If not, then convert and show it.

StudentID	Subjects	Student Name
101	Maths	Raghu
102	Biology, maths	Neha
103	English, history	Abhinav

C. Draws E-R diagram for case study below:

i. Organization has many departments. Each department has unique name, location and an employee who manages the department.

ii. Many projects are run by one or more departments. Project has a name, id and employees managing it.

iii. Employees, has empID, name, address, belongs to one department but can be involved in one or more projects.

3. A. Construct a deterministic turning machine for the language,

L = {aibjck; where I * j = k and i, j, k ≥ 1}.

Describe your strategy in words and construct the state transition diagram.

B. construct a push down automata for the string that contains equal number of a's and b's. Describe your strategy in words and construct the state transition diagram.

C. Write a regular expression for binary numbers that are multiples of tree such as 0,11,110,1001, etc. Also, build a determinsistic finite state automata that can accept the above sequence of binary numbers.

D. Is the following language regular?

L = {$a^n b^n$; n ≥ 1}

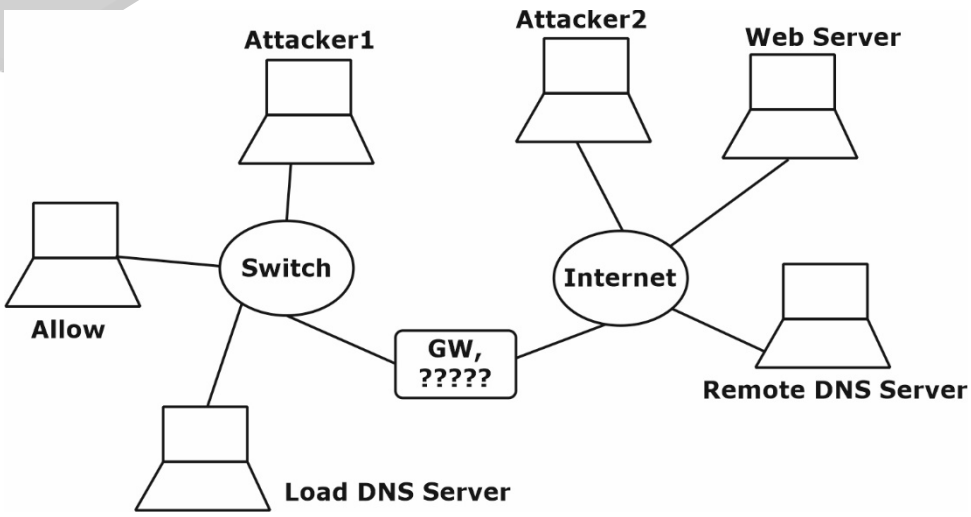
Justify your answer using pumping lemma.

4. A. What are Virtual Private Networks? Why is it more relevant while using public WiFi networks?

B. Given a graph what is the importance of the node with highest betweenness centrality measure?

C. In IPv4 header, what does TTL field mean? How is TTL used by traceroute command?

5. A. You are given a plain text which is MISSILE INDIA, and the key is DRDO. Please encrypt using Caesar and Vigenere methods and show the results for both. Argue which method is breakable more easily and which one is harder? Give reasons for the same.



B. For the diagram above, answer the following.

i. Describe how Attacker 1 perform DNS poisoning attack. Describe step-by-step procedure.

ii. Describe how Attacker 2 can successfully perform source-routing based MITM and what Attacker 2 needs to achieve this goal. Describe step-by-step procedure.

iii. Attacker can deploy TCP SYN to exhaust the server connection queues. Provide at least two solutions to defend against such attacks. Describe why these solutions will be effective.

C. Consider you are connected to https://www.drdo.gov.in.

i. Is it possible for an attacker to impersonate the above website. If yes how would an attacker launch such spoofing attacks?

ii. Given the above state of affairs, what we the existing defense mechanism that prevent/mitigate such attacks and why are they effective?

D. Why does the current Internet architecture require the feature of IP address change. Given that this feature is central to many IP spoofing attacks, can this feature be removed? If not, can you mention and elaborate some core services (at least one) that use this feature.

6. A. Let us assume that there are C documents in a corpus with T terms in it, and 'DRDO' appears D time in the document. What is the product of Term Frequency vs Inverse Document frequency if 'DRDO' appears in one fourth of the total document?

B. Consider the following text "Automobiles can broadly be divided into passenger vehicles and goods vehicles. Passenger and goods vehicles can in turn be categorized into light vehicles, and heavy vehicles. Scooters, motor cycles, and cars are passenger vehicles that are light, whereas, buses, trains, and flights are heavy passenger vehicle. Vans, and light trucks are goods vehicles that are light, whereas trucks and tractors are heavy vehicles that carry goods. Every automobile has exactly one engine, but several wheels, and sub classes from the above text and build a tree that depict the class hierarchy. Along with the classes, identify the properties and instances/members and mention the classes to which they are associated with.

C. The following table provides height and weight of three people.

Person	Height(x) in cm	Weight(y) in kgs
P1	140	50
P2	150	70
P3	160	60

Let the least square regression line for the given set of points in the above table be $y = ax + b$. Find a and b.

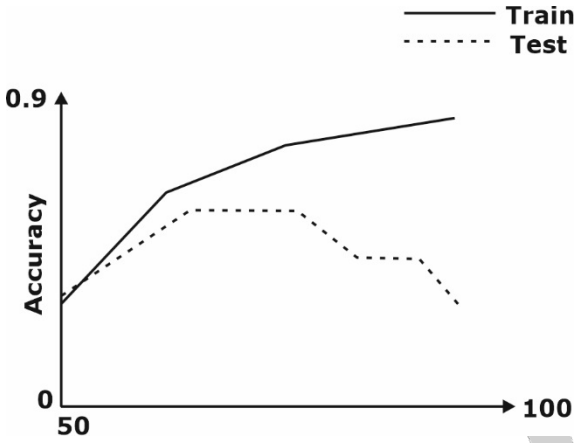
D. Consider the Figure below.

Consider the training and test accuracy curves plotted for decision tree learning. Decision tree is used to learn functions $f : x \rightarrow y$, where training and test samples are drawn independently at random from underlying distribution P(a), after which the trainer provides noise free lables Y.

Note: error = 1 – accuracy

i. Does training error at each point provide unbiased estimate of true error? Justify.

ii. Does test error at each point provide unbiased estimate of true error? Justify.



iii. Does training minus test accuracy provides an unbiased estimate of the degree of overfitting? Justify.

7. A. Write and explain all key phases of compiler design.

B. Write C program using lexical analysis to remove all comments in a given program.

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