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"If You Have An Apple And I Have An Apple And We Exchange Apples Then You And I Will Still Each Have One Apple. But If You Have An Idea And I Have An Idea And We Exchange These Ideas, Then Each Of Us Will Have Two Ideas."
--- George Bernard Shaw (1856-1950)

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SQL

1. Which is the subset of SQL commands used to manipulate Oracle Database structures, including tables?

Data Definition Language (DDL)

2. What operator performs pattern matching?

LIKE operator

3. What operator tests column for the absence of data?

IS NULL operator

4. Which command executes the contents of a specified file?

START <filename> or @<filename>

5. What is the parameter substitution symbol used with INSERT INTO command?

&

6. Which command displays the SQL command in the SQL buffer, and then executes it?

RUN

7. What are the wildcards used for pattern matching?

_ for single character substitution and % for multi-character substitution

8. State true or false. EXISTS, SOME, ANY are operators in SQL.

True

9. State true or false. !=, <>, ^= all denote the same operation.

True

10. What are the privileges that can be granted on a table by a user to others?

Insert, update, delete, select, references, index, execute, alter, all

11. What command is used to get back the privileges offered by the GRANT command?

REVOKE

12. Which system tables contain information on privileges granted and privileges obtained?

USER_TAB_PRIVS_MADE, USER_TAB_PRIVS_RECD

13. Which system table contains information on constraints on all the tables created?

USER_CONSTRAINTS

14. TRUNCATE TABLE EMP;
DELETE FROM EMP;
Will the outputs of the above two commands differ?

Both will result in deleting all the rows in the table EMP.

15. What is the difference between TRUNCATE and DELETE commands?

TRUNCATE is a DDL command whereas DELETE is a DML command. Hence DELETE operation can be rolled back, but TRUNCATE operation cannot be rolled back. WHERE clause can be used with DELETE and not with TRUNCATE.

16. What command is used to create a table by copying the structure of another table?

Answer :

CREATE TABLE .. AS SELECT command

Explanation :

To copy only the structure, the WHERE clause of the SELECT command should contain a FALSE statement as in the following.

CREATE TABLE NEWTABLE AS SELECT * FROM EXISTINGTABLE WHERE 1=2;

If the WHERE condition is true, then all the rows or rows satisfying the condition will be copied to the new table.

17. What will be the output of the following query?

*SELECT REPLACE(TRANSLATE(LTRIM(RTRIM('!! ATHEN !!','!'), '!'), 'AN', '**'),'*','TROUBLE') FROM DUAL;*

TROUBLETHETROUBLE

18. What will be the output of the following query?

SELECT DECODE(TRANSLATE('A','1234567890','1111111111'), '1','YES', 'NO');

Answer :

NO

Explanation :

The query checks whether a given string is a numerical digit.

19. What does the following query do?

SELECT SAL + NVL(COMM,0) FROM EMP;

This displays the total salary of all employees. The null values in the commission column will be replaced by 0 and added to salary.

20. Which date function is used to find the difference between two dates?

MONTHS_BETWEEN

21. Why does the following command give a compilation error?

DROP TABLE &TABLE_NAME;

Variable names should start with an alphabet. Here the table name starts with an '&' symbol.

22. What is the advantage of specifying WITH GRANT OPTION in the GRANT command?

The privilege receiver can further grant the privileges he/she has obtained from the owner to any other user.

23. What is the use of the DROP option in the ALTER TABLE command?

It is used to drop constraints specified on the table.

24. What is the value of 'comm' and 'sal' after executing the following query if the initial value of 'sal' is 10000?

*UPDATE EMP SET SAL = SAL + 1000, COMM = SAL*0.1;*

sal = 11000, comm = 1000

25. What is the use of DESC in SQL?

Answer :

DESC has two purposes. It is used to describe a schema as well as to retrieve rows from table in descending order.

Explanation :

The query SELECT * FROM EMP ORDER BY ENAME DESC will display the output sorted on ENAME in descending order.

26. What is the use of CASCADE CONSTRAINTS?

When this clause is used with the DROP command, a parent table can be dropped even when a child table exists.

27. Which function is used to find the largest integer less than or equal to a specific value?

FLOOR

28. What is the output of the following query?

SELECT TRUNC(1234.5678,-2) FROM DUAL;

1200

SQL – QUERIES

I. SCHEMAS

Table 1 : ***STUDIES***

PNAME (VARCHAR), SPLACE (VARCHAR), COURSE (VARCHAR), CCOST (NUMBER)

Table 2 : ***SOFTWARE***

PNAME (VARCHAR), TITLE (VARCHAR), DEVIN (VARCHAR), SCOST (NUMBER), DCOST (NUMBER), SOLD (NUMBER)

Table 3 : ***PROGRAMMER***

PNAME (VARCHAR), DOB (DATE), DOJ (DATE), SEX (CHAR), PROF1 (VARCHAR), PROF2 (VARCHAR), SAL (NUMBER)

LEGEND :

PNAME – Programmer Name, SPLACE – Study Place, CCOST – Course Cost, DEVIN – Developed in, SCOST – Software Cost, DCOST – Development Cost, PROF1 – Proficiency 1

QUERIES :

1. *Find out the selling cost average for packages developed in Oracle.*
2. *Display the names, ages and experience of all programmers.*
3. *Display the names of those who have done the PGDCA course.*
4. *What is the highest number of copies sold by a package?*
5. *Display the names and date of birth of all programmers born in April.*
6. *Display the lowest course fee.*
7. *How many programmers have done the DCA course.*
8. *How much revenue has been earned through the sale of packages developed in C.*
9. *Display the details of software developed by Rakesh.*
10. *How many programmers studied at Pentafour.*
11. *Display the details of packages whose sales crossed the 5000 mark.*
12. *Find out the number of copies which should be sold in order to recover the development cost of each package.*
13. *Display the details of packages for which the development cost has been recovered.*
14. *What is the price of costliest software developed in VB?*
15. *How many packages were developed in Oracle ?*
16. *How many programmers studied at PRAGATHI?*
17. *How many programmers paid 10000 to 15000 for the course?*
18. *What is the average course fee?*
19. *Display the details of programmers knowing C.*
20. *How many programmers know either C or Pascal?*
21. *How many programmers don't know C and C++?*
22. *How old is the oldest male programmer?*
23. *What is the average age of female programmers?*
24. *Calculate the experience in years for each programmer and display along with their names in descending order.*
25. *Who are the programmers who celebrate their birthdays during the current month?*
26. *How many female programmers are there?*
27. *What are the languages known by the male programmers?*
28. *What is the average salary?*
29. *How many people draw 5000 to 7500?*
30. *Display the details of those who don't know C, C++ or Pascal.*
31. *Display the costliest package developed by each programmer.*
32. *Produce the following output for all the male programmers*
    Programmer
    Mr. Arvind – has 15 years of experience

KEYS:

1. SELECT AVG(SCOST) FROM SOFTWARE WHERE DEVIN = 'ORACLE';
2. SELECT PNAME,TRUNC(MONTHS_BETWEEN(SYSDATE,DOB)/12) "AGE", TRUNC(MONTHS_BETWEEN(SYSDATE,DOJ)/12) "EXPERIENCE" FROM PROGRAMMER;

3. SELECT PNAME FROM STUDIES WHERE COURSE = 'PGDCA';
4. SELECT MAX(SOLD) FROM SOFTWARE;
5. SELECT PNAME, DOB FROM PROGRAMMER WHERE DOB LIKE '%APR%';
6. SELECT MIN(CCOST) FROM STUDIES;
7. SELECT COUNT(*) FROM STUDIES WHERE COURSE = 'DCA';
8. SELECT SUM(SCOST*SOLD-DCOST) FROM SOFTWARE GROUP BY DEVIN HAVING DEVIN = 'C';
9. SELECT * FROM SOFTWARE WHERE PNAME = 'RAKESH';
10. SELECT * FROM STUDIES WHERE SPLACE = 'PENTAFOUR';
11. SELECT * FROM SOFTWARE WHERE SCOST*SOLD-DCOST > 5000;
12. SELECT CEIL(DCOST/SCOST) FROM SOFTWARE;
13. SELECT * FROM SOFTWARE WHERE SCOST*SOLD >= DCOST;
14. SELECT MAX(SCOST) FROM SOFTWARE GROUP BY DEVIN HAVING DEVIN = 'VB';
15. SELECT COUNT(*) FROM SOFTWARE WHERE DEVIN = 'ORACLE';
16. SELECT COUNT(*) FROM STUDIES WHERE SPLACE = 'PRAGATHI';
17. SELECT COUNT(*) FROM STUDIES WHERE CCOST BETWEEN 10000 AND 15000;
18. SELECT AVG(CCOST) FROM STUDIES;
19. SELECT * FROM PROGRAMMER WHERE PROF1 = 'C' OR PROF2 = 'C';
20. SELECT * FROM PROGRAMMER WHERE PROF1 IN ('C','PASCAL') OR PROF2 IN ('C','PASCAL');
21. SELECT * FROM PROGRAMMER WHERE PROF1 NOT IN ('C','C++') AND PROF2 NOT IN ('C','C++');
22. SELECT TRUNC(MAX(MONTHS_BETWEEN(SYSDATE,DOB)/12)) FROM PROGRAMMER WHERE SEX = 'M';
23. SELECT TRUNC(AVG(MONTHS_BETWEEN(SYSDATE,DOB)/12)) FROM PROGRAMMER WHERE SEX = 'F';
24. SELECT PNAME, TRUNC(MONTHS_BETWEEN(SYSDATE,DOJ)/12) FROM PROGRAMMER ORDER BY PNAME DESC;
25. SELECT PNAME FROM PROGRAMMER WHERE TO_CHAR(DOB,'MON') = TO_CHAR(SYSDATE,'MON');
26. SELECT COUNT(*) FROM PROGRAMMER WHERE SEX = 'F';
27. SELECT DISTINCT(PROF1) FROM PROGRAMMER WHERE SEX = 'M';
28. SELECT AVG(SAL) FROM PROGRAMMER;
29. SELECT COUNT(*) FROM PROGRAMMER WHERE SAL BETWEEN 5000 AND 7500;
30. SELECT * FROM PROGRAMMER WHERE PROF1 NOT IN ('C','C++','PASCAL') AND PROF2 NOT IN ('C','C++','PASCAL');
31. SELECT PNAME,TITLE,SCOST FROM SOFTWARE WHERE SCOST IN (SELECT MAX(SCOST) FROM SOFTWARE GROUP BY PNAME);
32. SELECT 'Mr.' || PNAME || ' - has ' || TRUNC(MONTHS_BETWEEN(SYSDATE,DOJ)/12) || ' years of experience' “Programmer” FROM PROGRAMMER WHERE SEX = 'M' UNION SELECT 'Ms.' || PNAME || ' - has ' || TRUNC (MONTHS_BETWEEN (SYSDATE,DOJ)/12) || ' years of experience' “Programmer” FROM PROGRAMMER WHERE SEX = 'F';

II . SCHEMA :

Table 1 : **DEPT**

DEPTNO (NOT NULL , NUMBER(2)), DNAME (VARCHAR2(14)),
LOC (VARCHAR2(13)

Table 2 : **EMP**

EMPNO (NOT NULL , NUMBER(4)), ENAME (VARCHAR2(10)),
JOB (VARCHAR2(9)), MGR (NUMBER(4)), HIREDATE (DATE),
SAL (NUMBER(7,2)), COMM (NUMBER(7,2)), DEPTNO (NUMBER(2))

MGR is the empno of the employee whom the employee reports to. DEPTNO is a foreign key.

QUERIES

1. List all the employees who have at least one person reporting to them.
2. List the employee details if and only if more than 10 employees are present in department no 10.
3. List the name of the employees with their immediate higher authority.
4. List all the employees who do not manage any one.
5. List the employee details whose salary is greater than the lowest salary of an employee belonging to deptno 20.
6. List the details of the employee earning more than the highest paid manager.
7. List the highest salary paid for each job.
8. Find the most recently hired employee in each department.
9. In which year did most people join the company? Display the year and the number of employees.
10. Which department has the highest annual remuneration bill?
11. Write a query to display a '' against the row of the most recently hired employee.*
12. Write a correlated sub-query to list out the employees who earn more than the average salary of their department.
13. Find the nth maximum salary.
14. Select the duplicate records (Records, which are inserted, that already exist) in the EMP table.
15. Write a query to list the length of service of the employees (of the form n years and m months).

KEYS:

1. SELECT DISTINCT(A.ENAME) FROM EMP A, EMP B WHERE A.EMPNO = B.MGR; or SELECT ENAME FROM EMP WHERE EMPNO IN (SELECT MGR FROM EMP);
2. SELECT * FROM EMP WHERE DEPTNO IN (SELECT DEPTNO FROM EMP GROUP BY DEPTNO HAVING COUNT(EMPNO)>10 AND DEPTNO=10);
3. SELECT A.ENAME "EMPLOYEE", B.ENAME "REPORTS TO" FROM EMP A, EMP B WHERE A.MGR=B.EMPNO;

4. SELECT * FROM EMP WHERE EMPNO IN (SELECT EMPNO FROM EMP MINUS SELECT MGR FROM EMP);
5. SELECT * FROM EMP WHERE SAL > (SELECT MIN(SAL) FROM EMP GROUP BY DEPTNO HAVING DEPTNO=20);
6. SELECT * FROM EMP WHERE SAL > (SELECT MAX(SAL) FROM EMP GROUP BY JOB HAVING JOB = 'MANAGER');
7. SELECT JOB, MAX(SAL) FROM EMP GROUP BY JOB;
8. SELECT * FROM EMP WHERE (DEPTNO, HIREDATE) IN (SELECT DEPTNO, MAX(HIREDATE) FROM EMP GROUP BY DEPTNO);
9. SELECT TO_CHAR(HIREDATE,'YYYY') "YEAR", COUNT(EMPNO) "NO. OF EMPLOYEES" FROM EMP GROUP BY TO_CHAR(HIREDATE,'YYYY') HAVING COUNT(EMPNO) = (SELECT MAX(COUNT(EMPNO)) FROM EMP GROUP BY TO_CHAR(HIREDATE,'YYYY'));
10. SELECT DEPTNO, LPAD(SUM(12*(SAL+NVL(COMM,0))),15) "COMPENSATION" FROM EMP GROUP BY DEPTNO HAVING SUM(12*(SAL+NVL(COMM,0))) = (SELECT MAX(SUM(12*(SAL+NVL(COMM,0)))) FROM EMP GROUP BY DEPTNO);
11. SELECT ENAME, HIREDATE, LPAD('*',8) "RECENTLY HIRED" FROM EMP WHERE HIREDATE = (SELECT MAX(HIREDATE) FROM EMP) UNION SELECT ENAME NAME, HIREDATE, LPAD(' ',15) "RECENTLY HIRED" FROM EMP WHERE HIREDATE != (SELECT MAX(HIREDATE) FROM EMP);
12. SELECT ENAME,SAL FROM EMP E WHERE SAL > (SELECT AVG(SAL) FROM EMP F WHERE E.DEPTNO = F.DEPTNO);
13. SELECT ENAME, SAL FROM EMP A WHERE &N = (SELECT COUNT (DISTINCT(SAL)) FROM EMP B WHERE A.SAL<=B.SAL);
14. SELECT * FROM EMP A WHERE A.EMPNO IN (SELECT EMPNO FROM EMP GROUP BY EMPNO HAVING COUNT(EMPNO)>1) AND A.ROWID!=MIN (ROWID));
15. SELECT ENAME "EMPLOYEE",TO_CHAR(TRUNC(MONTHS_BETWEEN(SYSDATE,HIREDATE)/12))||' YEARS '|| TO_CHAR(TRUNC(MOD(MONTHS_BETWEEN (SYSDATE, HIREDATE),12)))||' MONTHS ' "LENGTH OF SERVICE" FROM EMP;

Computer Networks

1. *What are the two types of transmission technology available?*
   (i) Broadcast and (ii) point-to-point

2. *What is subnet?*
   A generic term for section of a large networks usually separated by a bridge or router.

3. *Difference between the communication and transmission.*
   Transmission is a physical movement of information and concern issues like bit polarity, synchronisation, clock etc.
   Communication means the meaning full exchange of information between two communication media.

4. *What are the possible ways of data exchange?*
   (i) Simplex (ii) Half-duplex (iii) Full-duplex.

5. *What is SAP?*
   Series of interface points that allow other computers to communicate with the other layers of network protocol stack.

6. *What do you meant by "triple X" in Networks?*
   The function of PAD (Packet Assembler Disassembler) is described in a document known as X.3. The standard protocol has been defined between the terminal and the PAD, called X.28; another standard protocol exists between hte PAD and the network, called X.29. Together, these three recommendations are often called "triple X"

7. *What is frame relay, in which layer it comes?*
   Frame relay is a packet switching technology. It will operate in the data link layer.

8. *What is terminal emulation, in which layer it comes?*
   Telnet is also called as terminal emulation. It belongs to application layer.

9. *What is Beaconing?*
   The process that allows a network to self-repair networks problems. The stations on the network notify the other stations on the ring when they are not receiving the transmissions. Beaconing is used in Token ring and FDDI networks.

10. *What is redirector?*
    Redirector is software that intercepts file or prints I/O requests and translates them into network requests. This comes under presentation layer.

11. *What is NETBIOS and NETBEUI?*
    NETBIOS is a programming interface that allows I/O requests to be sent to and received from a remote computer and it hides the networking hardware from

applications.

NETBEUI is NetBIOS extended user interface. A transport protocol designed by microsoft and IBM for the use on small subnets.

12. *What is RAID?*

A method for providing fault tolerance by using multiple hard disk drives.

13. *What is passive topology?*

When the computers on the network simply listen and receive the signal, they are referred to as passive because they don't amplify the signal in any way. Example for passive topology - linear bus.

14. *What is Brouter?*

Hybrid devices that combine the features of both bridges and routers.

15. *What is cladding?*

A layer of a glass surrounding the center fiber of glass inside a fiber-optic cable.

16. *What is point-to-point protocol*

A communications protocol used to connect computers to remote networking services including Internet service providers.

17. *How Gateway is different from Routers?*

A gateway operates at the upper levels of the OSI model and translates information between two completely different network architectures or data formats

18. *What is attenuation?*

The degeneration of a signal over distance on a network cable is called attenuation.

19. *What is MAC address?*

The address for a device as it is identified at the Media Access Control (MAC) layer in the network architecture. MAC address is usually stored in ROM on the network adapter card and is unique.

20. *Difference between bit rate and baud rate.*

Bit rate is the number of bits transmitted during one second whereas baud rate refers to the number of signal units per second that are required to represent those bits.

baud rate = bit rate / N

where N is no-of-bits represented by each signal shift.

21. *What is Bandwidth?*

Every line has an upper limit and a lower limit on the frequency of signals it can carry. This limited range is called the bandwidth.

22. What are the types of Transmission media?

Signals are usually transmitted over some transmission media that are broadly classified in to two categories.

a) Guided Media:

These are those that provide a conduit from one device to another that include twisted-pair, coaxial cable and fiber-optic cable. A signal traveling along any of these media is directed and is contained by the physical limits of the medium. Twisted-pair and coaxial cable use metallic that accept and transport signals in the form of electrical current. Optical fiber is a glass or plastic cable that accepts and transports signals in the form of light.

b) Unguided Media:

This is the wireless media that transport electromagnetic waves without using a physical conductor. Signals are broadcast either through air. This is done through radio communication, satellite communication and cellular telephony.

23. *What is Project 802?*

It is a project started by IEEE to set standards to enable intercommunication between equipment from a variety of manufacturers. It is a way for specifying functions of the physical layer, the data link layer and to some extent the network layer to allow for interconnectivity of major LAN
protocols.

It consists of the following:

- Ø 802.1 is an internetworking standard for compatibility of different LANs and MANs across protocols.
- Ø 802.2 Logical link control (LLC) is the upper sublayer of the data link layer which is non-architecture-specific, that is remains the same for all IEEE-defined LANs.
- Ø Media access control (MAC) is the lower sublayer of the data link layer that contains some distinct modules each carrying proprietary information specific to the LAN product being used. The modules are Ethernet LAN (802.3), Token ring LAN (802.4), Token bus LAN (802.5).
- Ø 802.6 is distributed queue dual bus (DQDB) designed to be used in MANs.

24. *What is Protocol Data Unit?*

The data unit in the LLC level is called the protocol data unit (PDU). The PDU contains of four fields a destination service access point (DSAP), a source service access point (SSAP), a control field and an information field. DSAP, SSAP are addresses used by the LLC to identify the protocol stacks on the receiving and sending machines that are generating and using the data. The control field specifies whether the PDU frame is a information frame (I - frame) or a supervisory frame (S - frame) or a unnumbered frame (U - frame).

25. *What are the different type of networking / internetworking devices?*

Repeater:

Also called a regenerator, it is an electronic device that operates only at physical layer. It receives the signal in the network before it becomes weak, regenerates the original bit pattern and puts the refreshed copy back in to the link.

Bridges:

These operate both in the physical and data link layers of LANs of same type. They divide a larger network in to smaller segments. They contain logic that allow them to keep the traffic for each segment separate and thus are repeaters that relay a frame only the side of the segment containing the intended recipent and control congestion.

Routers:

They relay packets among multiple interconnected networks (i.e. LANs of different type). They operate in the physical, data link and network layers. They contain software that enable them to determine which of the several possible paths is the best for a particular transmission.

Gateways:

They relay packets among networks that have different protocols (e.g. between a LAN and a WAN). They accept a packet formatted for one protocol and convert it to a packet formatted for another protocol before forwarding it. They operate in all seven layers of the OSI model.

26. *What is ICMP?*

ICMP is Internet Control Message Protocol, a network layer protocol of the TCP/IP suite used by hosts and gateways to send notification of datagram problems back to the sender. It uses the echo test / reply to test whether a destination is reachable and responding. It also handles both control and error messages.

27. *What are the data units at different layers of the TCP / IP protocol suite?*

The data unit created at the application layer is called a message, at the transport layer the data unit created is called either a segment or an user datagram, at the network layer the data unit created is called the datagram, at the data link layer the datagram is encapsulated in to a frame and finally transmitted as signals along the transmission media.

28. *What is difference between ARP and RARP?*

The address resolution protocol (ARP) is used to associate the 32 bit IP address with the 48 bit physical address, used by a host or a router to find the physical address of another host on its network by sending a ARP query packet that includes the IP address of the receiver.

The reverse address resolution protocol (RARP) allows a host to discover its Internet address when it knows only its physical address.

29. What is the minimum and maximum length of the header in the TCP segment and IP datagram?

The header should have a minimum length of 20 bytes and can have a maximum length of 60 bytes.

30. *What is the range of addresses in the classes of internet addresses?*

Class A	0.0.0.0	-	127.255.255.255
Class B	128.0.0.0	-	191.255.255.255
Class C	192.0.0.0	-	223.255.255.255
Class D	224.0.0.0	-	239.255.255.255
Class E	240.0.0.0	-	247.255.255.255

31. *What is the difference between TFTP and FTP application layer protocols?*

The Trivial File Transfer Protocol (TFTP) allows a local host to obtain files from a remote host but does not provide reliability or security. It uses the fundamental packet delivery services offered by UDP.

The File Transfer Protocol (FTP) is the standard mechanism provided by TCP / IP for copying a file from one host to another. It uses the services offer by TCP and

so is reliable and secure. It establishes two connections (virtual circuits) between the hosts, one for data transfer and another for control information.

32. What are major types of networks and explain?

Ø Server-based network

Ø Peer-to-peer network

Peer-to-peer network, computers can act as both servers sharing resources and as clients using the resources.

Server-based networks provide centralized control of network resources and rely on server computers to provide security and network administration

33. *What are the important topologies for networks?*

Ø *BUS topology:*

In this each computer is directly connected to primary network cable in a single line.

Advantages:

Inexpensive, easy to install, simple to understand, easy to extend.

Ø *STAR topology:*

In this all computers are connected using a central hub.

Advantages:

Can be inexpensive, easy to install and reconfigure and easy to trouble shoot physical problems.

Ø *RING topology:*

In this all computers are connected in loop.

Advantages:

All computers have equal access to network media, installation can be simple, and signal does not degrade as much as in other topologies because each computer regenerates it.

34. *What is mesh network?*

A network in which there are multiple network links between computers to provide multiple paths for data to travel.

35. *What is difference between baseband and broadband transmission?*

In a baseband transmission, the entire bandwidth of the cable is consumed by a single signal. In broadband transmission, signals are sent on multiple frequencies, allowing multiple signals to be sent simultaneously.

36. *Explain 5-4-3 rule?*

In a Ethernet network, between any two points on the network ,there can be no more than five network segments or four repeaters, and of those five segments only three of segments can be populated.

37. *What MAU?*

In token Ring , hub is called Multistation Access Unit(MAU).

38. *What is the difference between routable and non- routable protocols?*

Routable protocols can work with a router and can be used to build large

networks. Non-Routable protocols are designed to work on small, local networks and cannot be used with a router

39. *Why should you care about the OSI Reference Model?*

It provides a framework for discussing network operations and design.

40. *What is logical link control?*

One of two sublayers of the data link layer of OSI reference model, as defined by the IEEE 802 standard. This sublayer is responsible for maintaining the link between computers when they are sending data across the physical network connection.

41. *What is virtual channel?*

Virtual channel is normally a connection from one source to one destination, although multicast connections are also permitted. The other name for virtual channel is virtual circuit.

42. *What is virtual path?*

Along any transmission path from a given source to a given destination, a group of virtual circuits can be grouped together into what is called path.

43. *What is packet filter?*

Packet filter is a standard router equipped with some extra functionality. The extra functionality allows every incoming or outgoing packet to be inspected. Packets meeting some criterion are forwarded normally. Those that fail the test are dropped.

44. *What is traffic shaping?*

One of the main causes of congestion is that traffic is often busy. If hosts could be made to transmit at a uniform rate, congestion would be less common. Another open loop method to help manage congestion is forcing the packet to be transmitted at a more predictable rate. This is called traffic shaping.

45. *What is multicast routing?*

Sending a message to a group is called multicasting, and its routing algorithm is called multicast routing.

46. *What is region?*

When hierarchical routing is used, the routers are divided into what we will call regions, with each router knowing all the details about how to route packets to destinations within its own region, but knowing nothing about the internal structure of other regions.

47. *What is silly window syndrome?*

It is a problem that can ruin TCP performance. This problem occurs when data are passed to the sending TCP entity in large blocks, but an interactive application on the receiving side reads 1 byte at a time.

48. *What are Digrams and Trigrams?*

The most common two letter combinations are called as digrams. e.g. th, in, er, re and an. The most common three letter combinations are called as trigrams. e.g. the, ing, and, and ion.

49. *Expand IDEA.*

IDEA stands for International Data Encryption Algorithm.

50. *What is wide-mouth frog?*

Wide-mouth frog is the simplest known key distribution center (KDC) authentication protocol.

51. What is Mail Gateway?

It is a system that performs a protocol translation between different electronic mail delivery protocols.

52. *What is IGP (Interior Gateway Protocol)?*

It is any routing protocol used within an autonomous system.

53. *What is EGP (Exterior Gateway Protocol)?*

It is the protocol the routers in neighboring autonomous systems use to identify the set of networks that can be reached within or via each autonomous system.

54. *What is autonomous system?*

It is a collection of routers under the control of a single administrative authority and that uses a common Interior Gateway Protocol.

55. *What is BGP (Border Gateway Protocol)?*

It is a protocol used to advertise the set of networks that can be reached with in an autonomous system. BGP enables this information to be shared with the autonomous system. This is newer than EGP (Exterior Gateway Protocol).

56. *What is Gateway-to-Gateway protocol?*

It is a protocol formerly used to exchange routing information between Internet core routers.

57. *What is NVT (Network Virtual Terminal)?*

It is a set of rules defining a very simple virtual terminal interaction. The NVT is used in the start of a Telnet session.

58. *What is a Multi-homed Host?*

It is a host that has a multiple network interfaces and that requires multiple IP addresses is called as a Multi-homed Host.

59. *What is Kerberos?*

It is an authentication service developed at the Massachusetts Institute of Technology. Kerberos uses encryption to prevent intruders from discovering passwords and gaining unauthorized access to files.

60. *What is OSPF?*

It is an Internet routing protocol that scales well, can route traffic along multiple paths, and uses knowledge of an Internet's topology to make accurate routing decisions.

61. *What is Proxy ARP?*

It is using a router to answer ARP requests. This will be done when the originating host believes that a destination is local, when in fact is lies beyond router.

62. *What is SLIP (Serial Line Interface Protocol)?*

It is a very simple protocol used for transmission of IP datagrams across a serial line.

63. *What is RIP (Routing Information Protocol)?*

It is a simple protocol used to exchange information between the routers.

64. *What is source route?*

It is a sequence of IP addresses identifying the route a datagram must follow. A source route may optionally be included in an IP datagram header.

Operating System

Following are a few basic questions that cover the essentials of OS:

1. *Explain the concept of Reentrancy.*

It is a useful, memory-saving technique for multiprogrammed timesharing systems. A *Reentrant Procedure* is one in which multiple users can share a single copy of a program during the same period. Reentrancy has 2 key aspects: The program code cannot modify itself, and the local data for each user process must be stored separately. Thus, the permanent part is the code, and the temporary part is the pointer back to the calling program and local variables used by that program. Each execution instance is called *activation*. It executes the code in the permanent part, but has its own copy of local variables/parameters. The temporary part associated with each activation is the *activation record*. Generally, the activation record is kept on the stack.

Note: A reentrant procedure *can* be interrupted and called by an interrupting program, and still execute correctly on returning to the procedure.

2. *Explain Belady's Anomaly.*

Also called FIFO anomaly. Usually, on increasing the number of frames allocated to a process' virtual memory, the process execution is faster, because fewer page faults occur. Sometimes, the reverse happens, i.e., the execution time increases even when more frames are allocated to the process. This is Belady's Anomaly. This is true for certain page reference patterns.

3. *What is a binary semaphore? What is its use?*

A binary semaphore is one, which takes only 0 and 1 as values. They are used to implement mutual exclusion and synchronize concurrent processes.

4. *What is thrashing?*

It is a phenomenon in virtual memory schemes when the processor spends most of its time swapping pages, rather than executing instructions. This is due to an inordinate number of page faults.

5. *List the Coffman's conditions that lead to a deadlock.*

- Mutual Exclusion: Only one process may use a critical resource at a time.
- Hold & Wait: A process may be allocated some resources while waiting for others.
- No Pre-emption: No resource can be forcible removed from a process holding it.
- Circular Wait: A closed chain of processes exist such that each process holds at least one resource needed by another process in the chain.

6. *What are short-, long- and medium-term scheduling?*

Long term scheduler determines which programs are admitted to the system for processing. It controls the *degree of multiprogramming*. Once admitted, a job becomes a process.

Medium term scheduling is part of the swapping function. This relates to processes that are in a blocked or suspended state. They are swapped out of real-

memory until they are ready to execute. The swapping-in decision is based on memory-management criteria.

Short term scheduler, also know as a *dispatcher* executes most frequently, and makes the finest-grained decision of which process should execute next. This scheduler is invoked whenever an event occurs. It may lead to interruption of one process by preemption.

7. What are turnaround time and response time?

Turnaround time is the interval between the submission of a job and its completion. Response time is the interval between submission of a request, and the first response to that request.

8. What are the typical elements of a process image?

- Ø User data: Modifiable part of user space. May include program data, user stack area, and programs that may be modified.
- Ø User program: The instructions to be executed.
- Ø System Stack: Each process has one or more LIFO stacks associated with it. Used to store parameters and calling addresses for procedure and system calls.
- Ø Process control Block (PCB): Info needed by the OS to control processes.

9. What is the Translation Lookaside Buffer (TLB)?

In a cached system, the base addresses of the last few referenced pages is maintained in registers called the TLB that aids in faster lookup. TLB contains those page-table entries that have been most recently used. Normally, each virtual memory reference causes 2 physical memory accesses-- one to fetch appropriate page-table entry, and one to fetch the desired data. Using TLB in-between, this is reduced to just one physical memory access in cases of TLB-hit.

10. What is the resident set and working set of a process?

Resident set is that portion of the process image that is actually in real-memory at a particular instant. Working set is that subset of resident set that is actually needed for execution. (Relate this to the variable-window size method for swapping techniques.)

11. When is a system in safe state?

The set of dispatchable processes is in a safe state if there exists at least one temporal order in which all processes can be run to completion without resulting in a deadlock.

12. What is cycle stealing?

We encounter cycle stealing in the context of Direct Memory Access (DMA). Either the DMA controller can use the data bus when the CPU does not need it, or it may force the CPU to temporarily suspend operation. The latter technique is called cycle stealing. Note that cycle stealing can be done only at specific break points in an instruction cycle.

13. What is meant by arm-stickiness?

If one or a few processes have a high access rate to data on one track of a storage disk, then they may monopolize the device by repeated requests to that track. This generally happens with most common device scheduling algorithms (LIFO,

SSTF, C-SCAN, etc). High-density multisurface disks are more likely to be affected by this than low density ones.

14. What are the stipulations of C2 level security?

C2 level security provides for:

- Discretionary Access Control
- Identification and Authentication
- Auditing
- Resource reuse

15. What is busy waiting?

The repeated execution of a loop of code while waiting for an event to occur is called busy-waiting. The CPU is not engaged in any real productive activity during this period, and the process does not progress toward completion.

16. Explain the popular multiprocessor thread-scheduling strategies.

- *Load Sharing:* Processes are not assigned to a particular processor. A global queue of threads is maintained. Each processor, when idle, selects a thread from this queue. Note that load *balancing* refers to a scheme where work is allocated to processors on a more permanent basis.
- *Gang Scheduling:* A set of related threads is scheduled to run on a set of processors at the same time, on a 1-to-1 basis. Closely related threads / processes may be scheduled this way to reduce synchronization blocking, and minimize process switching. Group scheduling predated this strategy.
- *Dedicated processor assignment:* Provides implicit scheduling defined by assignment of threads to processors. For the duration of program execution, each program is allocated a set of processors equal in number to the number of threads in the program. Processors are chosen from the available pool.
- *Dynamic scheduling:* The number of thread in a program can be altered during the course of execution.

17. When does the condition 'rendezvous' arise?

In message passing, it is the condition in which, both, the sender and receiver are blocked until the message is delivered.

18. What is a trap and trapdoor?

Trapdoor is a secret undocumented entry point into a program used to grant access without normal methods of access authentication. A trap is a software interrupt, usually the result of an error condition.

19. What are local and global page replacements?

Local replacement means that an incoming page is brought in only to the relevant process' address space. Global replacement policy allows any page frame from any process to be replaced. The latter is applicable to variable partitions model only.

20. Define latency, transfer and seek time with respect to disk I/O.

Seek time is the time required to move the disk arm to the required track. Rotational delay or latency is the time it takes for the beginning of the required sector

to reach the head. Sum of seek time (if any) and latency is the access time. Time taken to actually transfer a span of data is transfer time.

21. Describe the Buddy system of memory allocation.

Free memory is maintained in linked lists, each of equal sized blocks. Any such block is of size 2^k. When some memory is required by a process, the block size of next higher order is chosen, and broken into two. Note that the two such pieces differ in address only in their kth bit. Such pieces are called buddies. When any used block is freed, the OS checks to see if its buddy is also free. If so, it is rejoined, and put into the original free-block linked-list.

22. What is time-stamping?

It is a technique proposed by Lamport, used to order events in a distributed system without the use of clocks. This scheme is intended to order events consisting of the transmission of messages. Each system 'i' in the network maintains a counter Ci. Every time a system transmits a message, it increments its counter by 1 and attaches the time-stamp Ti to the message. When a message is received, the receiving system 'j' sets its counter Cj to 1 more than the maximum of its current value and the incoming time-stamp Ti. At each site, the ordering of messages is determined by the following rules: For messages x from site i and y from site j, x precedes y if one of the following conditions holds....(a) if Ti<Tj or (b) if Ti=Tj and i<j.

23. How are the wait/signal operations for monitor different from those for semaphores?

If a process in a monitor signal and no task is waiting on the condition variable, the signal is lost. So this allows easier program design. Whereas in semaphores, every operation affects the value of the semaphore, so the wait and signal operations should be perfectly balanced in the program.

24. In the context of memory management, what are placement and replacement algorithms?

Placement algorithms determine where in available real-memory to load a program. Common methods are first-fit, next-fit, best-fit. Replacement algorithms are used when memory is full, and one process (or part of a process) needs to be swapped out to accommodate a new program. The replacement algorithm determines which are the partitions to be swapped out.

25. In loading programs into memory, what is the difference between load-time dynamic linking and run-time dynamic linking?

For load-time dynamic linking: Load module to be loaded is read into memory. Any reference to a target external module causes that module to be loaded and the references are updated to a relative address from the start base address of the application module.

With run-time dynamic loading: Some of the linking is postponed until actual reference during execution. Then the correct module is loaded and linked.

26. What are demand- and pre-paging?

With demand paging, a page is brought into memory only when a location on that page is actually referenced during execution. With pre-paging, pages other than

the one demanded by a page fault are brought in. The selection of such pages is done based on common access patterns, especially for secondary memory devices.

27. Paging a memory management function, while multiprogramming a processor management function, are the two interdependent?

Yes.

28. What is page cannibalizing?

Page swapping or page replacements are called page cannibalizing.

29. What has triggered the need for multitasking in PCs?

- Increased speed and memory capacity of microprocessors together with the support fir virtual memory and
- Growth of client server computing

30. What are the four layers that Windows NT have in order to achieve independence?

- Hardware abstraction layer
- Kernel
- Subsystems
- System Services.

31. What is SMP?

To achieve maximum efficiency and reliability a mode of operation known as symmetric multiprocessing is used. In essence, with SMP any process or threads can be assigned to any processor.

32. What are the key object oriented concepts used by Windows NT?

- Encapsulation
- Object class and instance

33. Is Windows NT a full blown object oriented operating system? Give reasons.

No Windows NT is not so, because its not implemented in object oriented language and the data structures reside within one executive component and are not represented as objects and it does not support object oriented capabilities .

34. What is a drawback of MVT?

It does not have the features like

- ability to support multiple processors
- virtual storage
- source level debugging

35. What is process spawning?

When the OS at the explicit request of another process creates a process, this action is called process spawning.

36. How many jobs can be run concurrently on MVT?

15 jobs

37. List out some reasons for process termination.

- Normal completion
- Time limit exceeded
- Memory unavailable
- Bounds violation
- Protection error
- Arithmetic error
- Time overrun
- I/O failure
- Invalid instruction
- Privileged instruction
- Data misuse
- Operator or OS intervention
- Parent termination.

38. What are the reasons for process suspension?
- swapping
- interactive user request
- timing
- parent process request

39. What is process migration?

It is the transfer of sufficient amount of the state of process from one machine to the target machine

40. What is mutant?

In Windows NT a mutant provides kernel mode or user mode mutual exclusion with the notion of ownership.

41. What is an idle thread?

The special thread a dispatcher will execute when no ready thread is found.

42. What is FtDisk?

It is a fault tolerance disk driver for Windows NT.

43. What are the possible threads a thread can have?
- Ready
- Standby
- Running
- Waiting
- Transition
- Terminated.

44. What are rings in Windows NT?

Windows NT uses protection mechanism called rings provides by the process to implement separation between the user mode and kernel mode.

45. What is Executive in Windows NT?

In Windows NT, executive refers to the operating system code that runs in kernel mode.

46. What are the sub-components of I/O manager in Windows NT?

- Network redirector/ Server
- Cache manager.
- File systems
- Network driver
- Device driver

47. What are DDks? Name an operating system that includes this feature.

DDks are device driver kits, which are equivalent to SDKs for writing device drivers. Windows NT includes DDks.

48. What level of security does Windows NT meets?

C2 level security.