ASSIGNMENT 02

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13.11.18.

Q:1 What is BOOLEAN ALGEBRA and give its applications.

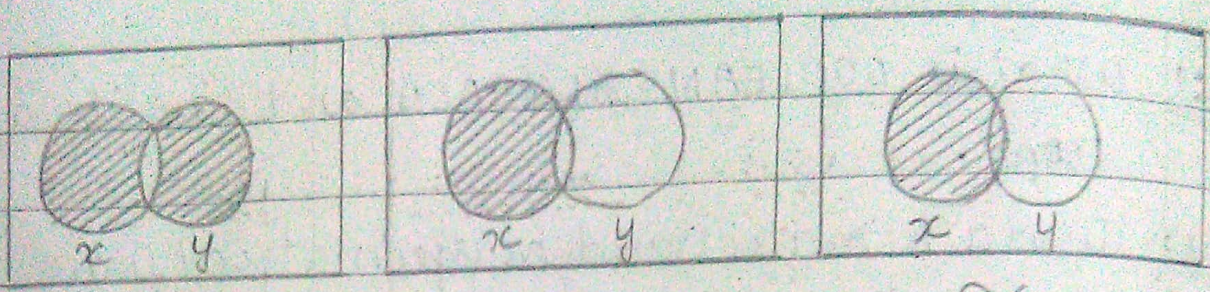
Ans: In Mathematics and mathematical logic, Boolean Algebra is a branch of algebra in which the values of the variables are the truth values true and false, usually denoted 1 and 0 respectively.
Applications are:

* Statement expressed in everyday language can be converted into mathematical expression such as letters or numbers.
* Boolean Algebra can be represented then by, the number 0 and 1 and also by electrical system that are either on or off.

Q:2 Explain BOOLEAN LAWS using VENN Diagrams.

Ans: i) **ABSORPTION LAW :** $x \cap (x \cup y) = x$

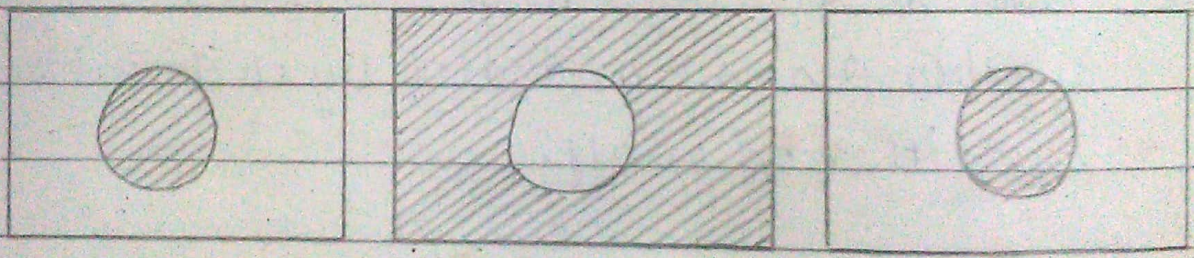
- Shade the position for $x \cup y$. Next, shade the portion for x. The shade the area that is common in both the diagrams:



$x \cup y$ x $x \cap (x \cup y)$

ii) **DOUBLE NEGATION LAW** : $(x')' = x$

- shade the circle x. The shade the area not in x. This will give the region for x'. Next shade the area that is not in x', which will be the whole of circle x.

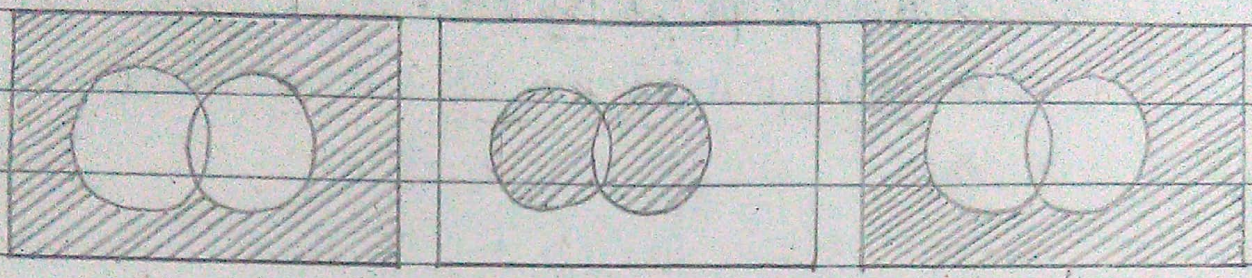


x x' $(x')'$

iii) **DE MORGAN'S LAW** : $x' \cap y' = (x \cap y)'$

- To visulize demorgan's law for the LHS, shade the area that is neither in x nor in y. Then for the RHS shade the area corresponding to $x \cup y$ which is the area in either or both the circles. Finally shade the area that is not in the region

of $x \cup y$.



$x' \cap y'$ $x \cap y$ $(x \cup y)'$

Q:3 Explain the steps to convert an SOP expression into its cannonical SOP form with help of an example :

Ans: i) Determine the product terms of an expression.

ii) Ensure that each product term has all the variables used in the BOOLEAN EXPRESSION.

iii) If there is a product term in which one or more variables are missing, then multiply that term with the sum of the missing variables and their compliment.

iv) Expand the BOOLEAN EXPRESSION and delete the reapited term from the expression:

EXAMPLE:

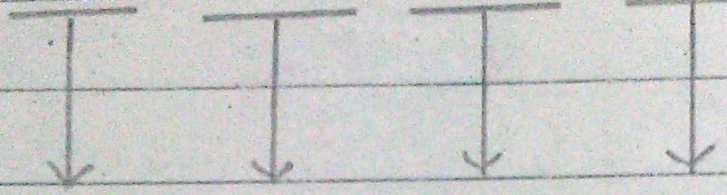
$$f(A, B, C) = A\bar{B} + B\bar{C} + A\bar{C}$$

$\Rightarrow A\bar{B}(C+\bar{C}) + B\bar{C}(A+\bar{A}) + A\bar{C}(B+\bar{B})$

$\Rightarrow A\bar{B}C + A\bar{B}\bar{C} + B\bar{C}A + \bar{A}B\bar{C} + AB\bar{C} + A\bar{B}\bar{C}$

$\Rightarrow A\bar{B}C + A\bar{B}\bar{C} + AB\bar{C} + \bar{A}B\bar{C}$ CANONICAL

$\Rightarrow$



101 100 110 010

$\Rightarrow m5 + m4 + m6 + m2$

- $f(A,B,C) = \Sigma m(2,4,5,6)$

13.11.18

ASSIGNMENT 03

Q:1 Define the term network and give its key advantages:

Ans: It is a collection of computers and devices interconnected to facilitate sharing of resources such as printer, compact disc etc. and electronic documents.

Advantages are:

i) **SHARING OF FILES**: The key benefit of computer network is that it facilitates its user to share files, & to access files that are stored on a remote computer.

ii) **SHARING OF RESOURCES**: Computer network facilitates the user to share the limited & otherwise expensive resources among of number of computer devices.

iii) **INCREASED STORAGE CAPACITY**: Attaching a number of computers to the network enables sharing of files. Files stored in one computer can be easily accessed by another computers.

iv) **INCREASED COST-EFFICIENCY**: The software packages available in the market are costly and take time for installation.

v) **SHARING OF LOAD**: If one computer is designed to carry out all the jobs than it is very likely that

the computer will slow down, thereby taking hours to complete all the jobs.

Q:2 What do you understand by the term connecting Media?

Ans: The computers on a network can be seperated by a few metres or nearly unlimited distances. Computers and other computing devices are connected by diff. types of media such as twisted-pair, cables, coaxial cables, optical fibres, & various wireless technologies.

Q:3 Differentiate between Simplex, half Duplex and Full Duplex modes of data transmission:

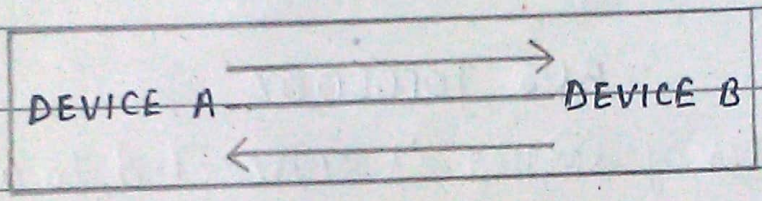
Ans:

SIMPLEX

- Data flows in only one direction from the sending device to the recieving device.
- It is used in Radio and T.V. transmission.
- Diagram:

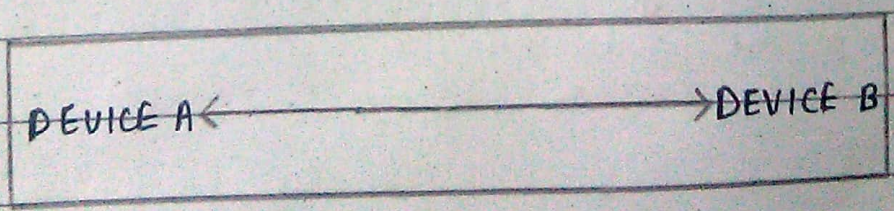
HALF DUPLEX

- There is only one communication channel to carry the data.
- It is used in vehicles, can come from both the direction but not at the same time.
- Diagram :



FULL DUPLEX

- Data flows in both the direction simultaneously each end of life line can transmit & recieve the data at the same time.
- It is widely applied in telephone system where both the caller & the reciever can talk at the same time.

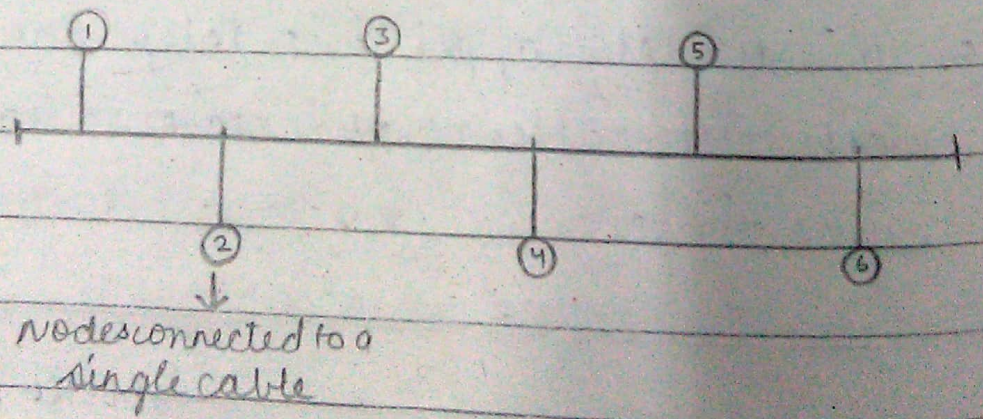


Q:4 What is TOPOLOGY ? Discuss the types of topologies used to form a network.

Ans: Topology refers to a schematic description of the arrangement of a network. It refers to actual geometric layout of computers & other devices connected to the network.

BUS TOPOLOGY

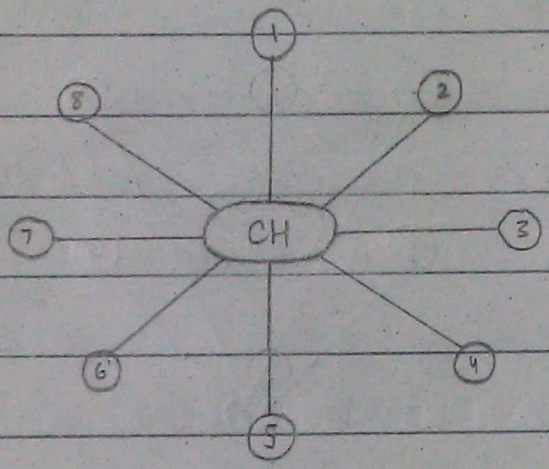
Each Computer of server is connected to a single cable Hence all the nodes share the same communication channel. when a node want to send message to another node, it creates a message and adds the address of the recipient to it.



STAR TOPOLOGY

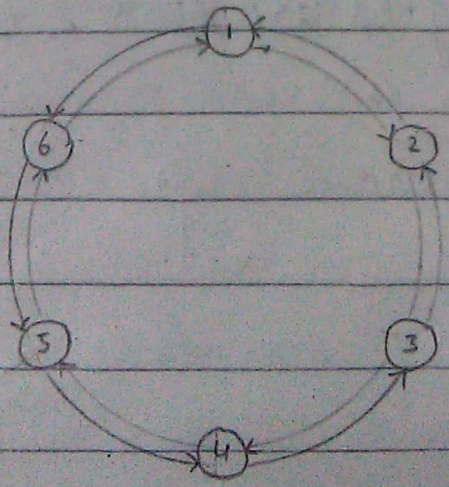
It is considered the easiest topology to design and

implement. In this, each node is connected to a central hub (SERVER) with a point to point connection. All traffic that travels the network passes through the central hub. That is, it is the host node that controls communication b/w other nodes.



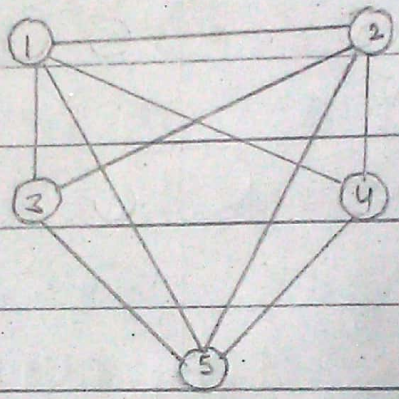
RING TOPOLOGY

All the nodes are connected to each other in a shape of a closed loop, so that every node is connected directly two two other nodes, one on either side of it.



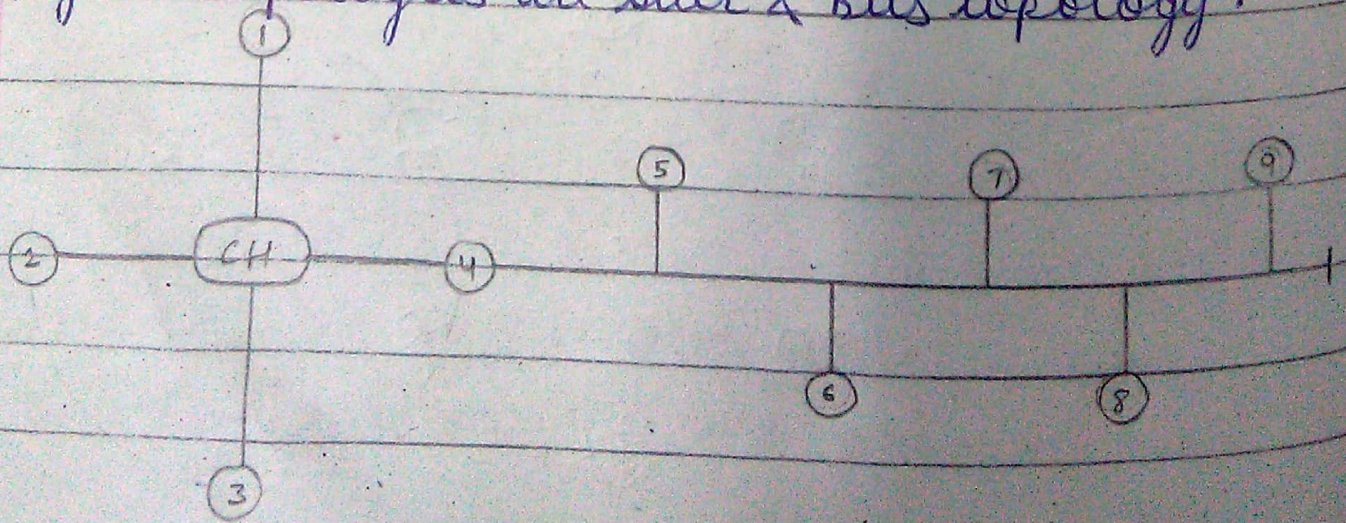
MESH TOPOLOGY

It is also known as a completely connected network. Every node is connect to every node on the network using a seperate physical link. Mesh topology involves the concept of routes.



HYBRID TOPOLOGY

It uses the combination of any two or more topologies in such a way that the resulting network does not exhibit one of the standard topology. Commonly used Hybrid topologies are star & Bus topology.



Q:5 Explain the role of repeater, hub, switch, bridge, router, gateway and NIC.

Ans: **REPEATER:**

When the data is transmitted over a network for long distances, the data signal gets weak after certain distance. This distance depends on the data transfer range of transmission channel being used and can be from a few meters to a few km. If the signal becomes weak, it cannot reach its destination. Therefore, some devices need a device which can re-strenthen the data signal before its get too weak. For this purpose reapeater is used. A repeater regenerates the recieved signal and re-transmits it to its destination.

HUB:

Hub is a device which is used to connect multiple computers/devices together in a network. A Hub has ports into which the cables from individual computer's NICs are inserted. Whenever a computer has to send some information to some other comp. The info. is sent by NIC to the hub. The the

hub re-transmits this info. to the other computers attached to it. The computer(s) for which the info. is intended recieves this info. and accept(s) it. Other computers on the network simply reject this information.

SWITCH :

A switch is an intelligent device that connects several nodes to form a network and redirects the recieved information only to the intended node(s). It looks exactly like a hub. It has the same function as a hub : to connect multiple devices in a network. But the diff. is that a hub broadcasts the information to all the connected devices but the the switch sends the information selectively only to those computers for which it is intended. This makes switch an intelligent & efficient than a hub.

BRIDGE :

It is a device that controls two or more LANs. When a single bridge recieves data from one LAN to forward it to another LAN, it first generates the

signal and then forwards the data to the other. Bridge can be programmed to reject pockets from particular network. However, Bridge do not normally allow connection of network with different architectures.

ROUTER:

It is an intelligent device that routes data to destination computer. the major task of the router is to route the data packets between two network on the best possible path for the fast data transmission.

GATEWAY:

It is a very complicated networking device that is basically used to connect two or more dissimilar networks that use entirely diff. protocols. A gateway can either be implemented in software or hardware. the other key role that a gateway perform is to provide security to the network.

NETWORK INTERFACE CARD (NIC):

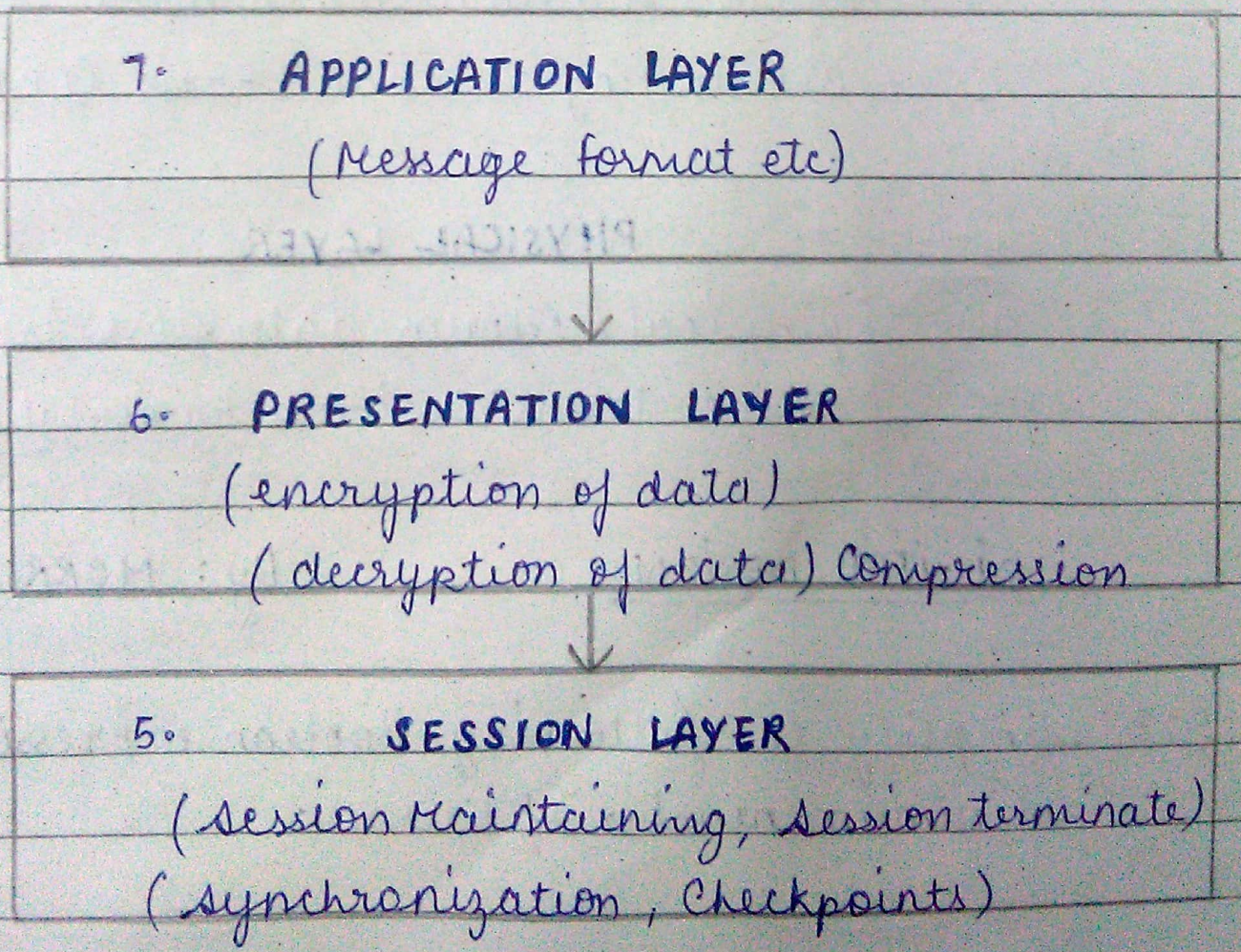
Any computer which has to be part of a computer network must have an NIC installed in it. A computer communicates with other computers on a network with the help of an NIC only. An NIC is a device that enables a computer to connect to a network and communicate. Nowadays, in most of the PCs and the laptops, NIC is an integral part of the motherboard.

Q:6 Explain the OSI Model in detail:

Ans: It is an abstract model that provide a networking framework of standards to enable diverse equipment and application from different vendors to communicate with each other.

The OSI Model divides the complex task of computer to computer communication into a series of 7 layers. These 7 layers are functionally independent of each other. Therefore any change made in one does not effect the function of other layers. During implementation the upper layers consisting of layers 7, 6, 5 are implemented using software

whereas the lower layer, 4, 3, 2, 1 are implemented using both hardware and software. In the OSI Model data is transferred from one layer to the next one. It starts from the application layer of the software of the sending device & goes until the physical layer. The data then travel over the channel to the next computer & moves back up the hierarchy. The application layer is closest to the end-user, whereas the physical layer is closer to the physical network medium.



4. **TRANSPORT LAYER**

(Heart of the OSI Model)

(connection oriented & less service)

3. **NETWORK LAYER**

(Frames are converted in PACKETS)

(Routing- Data goes from diff. paths)

2. **DATA LINK LAYER**

(FRAMING of data which in Bits)

(Bit stuffing, Flow and Error Control)

1. **PHYSICAL LAYER**

(physical medium, data stores is in BITS)

(defines transmission & topology medium)

Date : / /

DIGITAL DESIGN

By : MORRIS MANO

Q:1 Simplify the following Boolean expressions to a minimum number of literals :

a) $xy + x\bar{y}$:

$= xy + x\bar{y}$

$= x(y + \bar{y})$

$= x(1)$

$= x$

b) $(x+y)(x+\bar{y})$:

$= x + x\bar{y} + xy + y\bar{y}$

$= x + x\bar{y} + xy$

$= x(1 + \bar{y} + y)$

$= x(1+1)$

$= x$

c) $xyz + \bar{x}y + xy\bar{z}$:

$= xy(z+\bar{z}) + \bar{x}y$

$= xy(1) + \bar{x}y$

$= xy + \bar{x}y$

$= y(x+\bar{x})$

$= y(1)$

$= y$

d) $\overline{(a+b)}\,\overline{(\bar{a}+\bar{b})}$:

$= (\bar{a} \cdot \bar{b})(\bar{\bar{a}} \cdot \bar{\bar{b}})$

$= (\bar{a}\bar{b})(ab)$

$= a\bar{a}b\bar{b}$

$= 0$

e) $(a+b+\bar{c})(\bar{a}\bar{b}+c)$:

$= a\bar{a}\bar{b} + ac + \bar{a}b\bar{b} + bc + \bar{a}b\bar{c} + c\bar{c}$

$= ac + bc + \bar{a}b\bar{c}$

f) $\bar{a}bc + ab\bar{c} + abc + \bar{a}b\bar{c}$:

$= bc(\bar{a}+a) + ab\bar{c} + \bar{a}b\bar{c}$

$= bc(1) + ab\bar{c} + \bar{a}b\bar{c}$

$= bc + (\bar{c}(ab + \bar{a}b))$

$= bc + (\bar{c}(b(a+\bar{a})))$

$= bc + (\bar{c}(b(1)))$

$= bc + b\bar{c}$

$= b(c+\bar{c})$

$= b(1)$

$= b$

Q:2 Simplify the following Boolean expressions to a minimum number of literals :

a) $abc + \bar{a}b + ab\bar{c}$:

$= ab(c+\bar{c}) + \bar{a}b$

$= ab + \bar{a}b$

$= b(a+\bar{a})$

$= b$

b) $\bar{x}yz + xz$

$= z(\bar{x}y + x)$

$= z(x+y)$

$= xz + yz$

c) $(\overline{x+y})(\bar{x}+\bar{y})$:

$= (\bar{x}\cdot\bar{y})(\bar{x}+\bar{y})$

$= \bar{x}\bar{y}\bar{x} + \bar{x}\bar{y}\bar{y}$

$= \bar{x}\bar{y} + \bar{x}\bar{y}$

$= \bar{x}\bar{y}$

d) $xy + x(wz + w\bar{z})$:

$= xy + xwz + wx\bar{z}$

$= xy + wx(z+\bar{z})$

$= xy + wx(1)$

$= xy + wx$

$= x(y+w)$

$= xy + wx$

e) $(b\bar{c} + \bar{a}d)(a\bar{b} + c\bar{d})$:

$= ab\bar{b}\bar{c} + b\bar{c}c\bar{d} + a\bar{a}\bar{b}d + \bar{a}cd\bar{d}$

$= 0$

f) $(\bar{a}+\bar{c})(a+\bar{b}+\bar{c})$:

$= a\bar{a} + \bar{a}\bar{b} + \bar{a}\bar{c} + a\bar{c} + \bar{b}\bar{c} + \bar{c}$

$= \bar{a}\bar{b} + \bar{a}\bar{c} + a\bar{c} + \bar{b}\bar{c} + \bar{c}$

$= \bar{c}(\bar{a}+a+\bar{b}+1) + \bar{a}\bar{b}$

$= \bar{c}(1+\bar{b}+1) + \bar{a}\bar{b}$

$= \bar{c} + \bar{a}\bar{b}$

$= \bar{a}\bar{b} + \bar{c}$