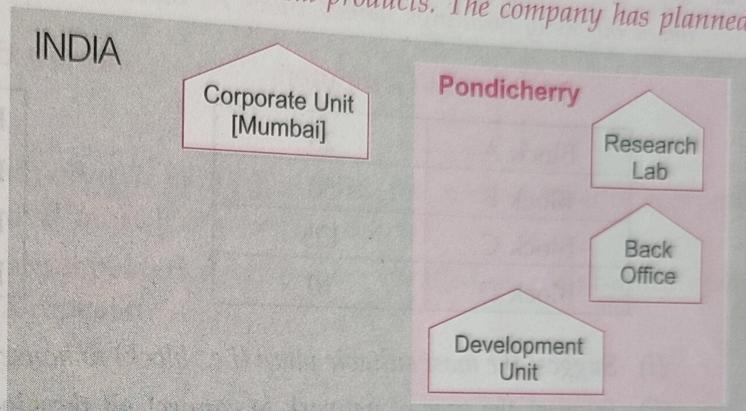


# Case Study Based Questions

## UNIT II : COMPUTER NETWORKS

1. "Bias Methodologies" is planning to expand their network in India, starting with three cities in India to build infrastructure for research and development of their chemical products. The company has planned to setup their main office in Pondicherry at three different locations and have named their offices as "Back Office", "Research Lab" and "Development Unit". The company has one more Research office namely "Corporate Office" in "Mumbai". A rough layout of the same is shown on the right.

Approximate distance between these offices is as follows :



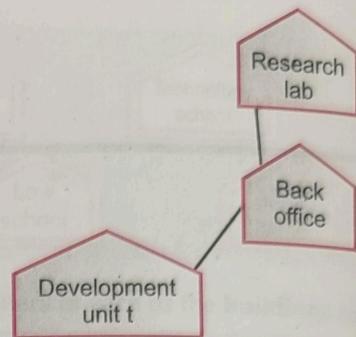
From	To	Distance
Research Lab	Back Office	110 m
Research Lab	Development Unit	16 km
Research Lab	Corporate Unit	1800 km
Back Office	Development Unit	13 km

In continuation of the above, the company experts have planned to install the following number of computers in each of their offices :

Research Lab	158
Back Office	79
Development Unit	90
Corporate Unit	51

- (i) Suggest the kind of network required (out of LAN, MAN, WAN) for connecting each of the following office units :
- ◆ Research Lab and Back Office
  - ◆ Research Lab and Development Unit
- (ii) Which one of the following devices will you suggest for connecting all the computers with in each of their office units ?
- ◆ Switch/Hub
  - ◆ Modem
  - ◆ Telephone
- (iii) Which of the following communication media, you will suggest to be procured by the company for connecting their local office units in Pondicherry for very effective (High Speed) communication ?
- ◆ Optical Fibre
  - ◆ Ethernet Cable
- (iv) Suggest a cable/wiring layout for connecting the company's local office units located in Pondicherry. Also, suggest an effective method/technology for connecting the company's office unit located in Mumbai.
- [Delhi 2008]

- Ans.** (i) Between Research Lab and Back office – LAN  
 Between Research Lab and Development unit – MAN  
 (ii) Switch/hub  
 (iii) Optical fibre  
 (iv) Suggested layout is shown in adjacent figure.  
 Technology for connecting to Mumbai office –  
 Sattellite.



2. Software Development Company has set up its new center at Raipur for its office and web based activities. It has 4 blocks of buildings named Block A, Block B, Block C, Block D. [CBSE Sample Paper 2019-20]

Number of Computers		Shortest distances between various Blocks in meters	
Block A	25	Block A to Block B	60 m
Block B	50	Block B to Block C	40 m
Block C	125	Block C to Block A	30 m
Block D	10	Block D to Block C	50 m

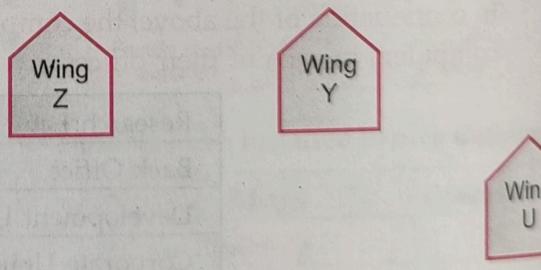
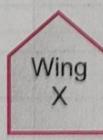
- (i) Suggest the most suitable place (i.e., block) to house the server of this company with a suitable reason.  
 (ii) Suggest the type of network to connect all the blocks with suitable reason.  
 (iii) The company is planning to link all the blocks through a secure and high speed wired medium. Suggest a way to connect all the blocks.  
 (iv) Suggest the most suitable wired medium for efficiently connecting each computer installed in every block out of the following network cables :

◆ Coaxial Cable      ◆ Ethernet Cable      ◆ Single Pair Telephone Cable.

**Ans.** (i) Block C, It has maximum number of computers.

- (ii) LAN    (iii) Star topology  
 (iv) Ethernet cable

3. The Great Brain Organisation has set up its new Branch at Srinagar for its office and web based activities. It has 4 Wings of buildings as shown in the diagram :



Center to center distances between various blocks

Wing X to Wing Z	50 m
Wing Z to Wing Y	70 m
Wing Y to Wing X	125 m
Wing Y to Wing U	80 m
Wing X to Wing U	175 m
Wing Z to Wing U	90 m

Number of Computers

Wing X	50
Wing Z	30
Wing Y	150
Wing U	15

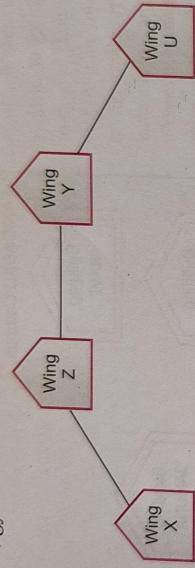
- (i) Suggest the most suitable cable layout of connections between the Wings, and topology.  
 (ii) Suggest the most suitable place (i.e., Wing) to house the server of this organisation with a suitable reason, with justification.

## CASE STUDY BASED QUESTIONS : UNIT 1 : Programming and Computational Thinking

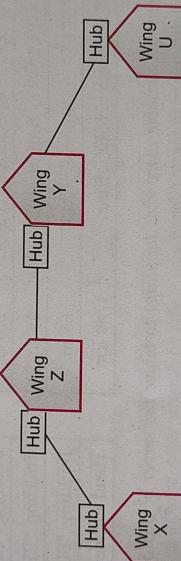
- (iii) Suggest the placement of the following devices with justification : (1) Repeater      (2) Hub/Switch  
 (iv) The organization is planning to link its head office situated in Delhi with the offices at Srinagar.  
 Suggest an economic way to connect it ; the company is ready to compromise on the speed of connectivity. Justify your answer.

Ans.

- (i) Bus Topology



- (ii) The most suitable place to house the server is Wing Y as it has the most number of computers thus cabling cost will be reduced and most traffic will be local.  
 (iii) (1) As per suggested layout separate repeaters need not be installed as each building/wing will be having a hub that acts as a repeater.  
 (2) One hub per wing.



- (iv) An economic way of connecting is Dial-up or broadband as it can connect two computers at an economic rate though it provides lesser speed than other expensive methods.

4. UNIVERSITY OF CORRESPONDENCE in Allahabad is setting up the network between its different wings. There are 4 wings named as Science (S), Journalism (J), ARTS (A) and Home Science (H).

Distance between various wings

Number of Computers
Wing A
Wing S
Wing J
Wing H

Wing A to Wing S	100 m
Wing A to Wing J	200 m
Wing A to Wing H	400 m
Wing S to Wing J	300 m
Wing S to Wing H	100 m
Wing J to Wing H	450 m

- (i) Suggest a suitable Topology for networking the computer of all wings.  
 (ii) Name the wing where the Server to be installed. Justify your answer.  
 (iii) Suggest the placement of Hub/Switch in the network.  
 (iv) Mention in economic technology to provide internet accessibility to all wings.

Ans.

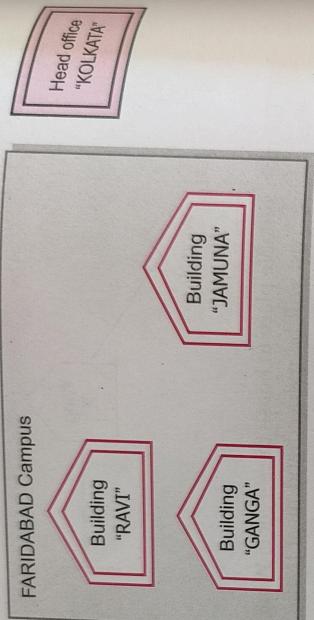
- (i) Star Topology can be used to network the computer of all wings.

- (ii) The Server should be installed in Wing A, as Wing A has maximum number of computer, installing the server in this wing will help to reduce the network traffic.
- (iii) Hub/Switch will be required in all the Wings.
- (iv) The economic way to provide internet accessibility to all wings is to use the proxy server at wing A and connect to the internet through a dial-up network.

5. Workalot Consultants are setting up a secured network for their office campus at Gurgaon for their day-to-day office and web-based activities. They are planning to have connectivity between 3 buildings and the head office situated in Mumbai. Answer the questions (i) to (iv) after going through the building positions in the campus and other details, which are given below.

Distances between various buildings

Building "GREEN" to Building "RED"	110 m
Building "GREEN" to Building "BLUE"	45 m
Building "BLUE" to Building "RED"	65 m
Gurgaon Campus to Head Office	1760 km



Number of Computers

Building "GREEN"	32
Building "RED"	150
Building "BLUE"	45
Head Office	10

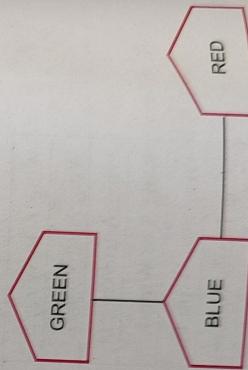
- (i) Suggest the most suitable place (i.e., building) to house the server of this organization. Also give a reason to justify your suggested location.
- (ii) Suggest a cable layout of connections between the buildings inside the campus.
- (iii) Suggest the placement of the following devices with justification :
  - 1. Switch
  - 2. Repeater
- (iv) The organization is planning to provide a high speed link with its head office situated in MUMBAI using a wired connection. Which of the following cables will be most suitable for this job ?
  - 1. Optical Fiber
  - 2. Co-axial Cable
  - 3. Ethernet Cable

Ans.

- (i) In building RED as it houses maximum number of computer ; hence most traffic will be local traffic if server is placed here.
- (ii) As they help share bandwidth in every building.

- (iii) Switches are needed in every building as per above layout, because distance is less than 100 m) however if building Green and building Red are directly connected, we can place a repeater there as the distance between these two buildings is more than 100 m.
- (iv) Fiber Optic

[Outside Delhi 2012]



Repeaters may be skipped as per above layout, (because distance is less than 100 m) however if building Green and building Red are directly connected, we can place a repeater there as the distance between these two buildings is more than 100 m.

## CASE STUDY BASED QUESTIONS : UNIT I : Programming and Computational Thinking

6. Perfect Edu Services Ltd. is an educational organization. It is planning to setup its India campus at Chennai with its head office at Delhi. The Chennai campus has 4 main buildings - ADMIN, ENGINEERING, BUSINESS and MEDIA.

You as a network expert have to suggest the best network related solutions for their problems raised in (i) to (iv), keeping in mind the distances between the buildings and other given parameters.

Shortest distances between various buildings :

ADMIN to ENGINEERING	55 m
ADMIN to BUSINESS	90 m
ADMIN to MEDIA	50 m
ENGINEERING to BUSINESS	55 m
ENGINEERING to MEDIA	50 m
BUSINESS to MEDIA	45 m
DELHI Head Office to CHENNAI Campus	2175 km

- (i) Suggest the most appropriate location of the server inside the CHENNAI campus (out of the 4 buildings), to get the best connectivity for maximum no. of computers. Justify your answer.  
 (ii) Suggest and draw the cable layout to efficiently connect various buildings within the CHENNAI campus for connecting the computers.  
 (iii) Which hardware device will you suggest to be procured by the company to be installed to protect and control the internet uses within the campus ?  
 (iv) Which of the following will you suggest to establish the online face-to-face communication between the people in the Admin Office of CHENNAI campus and DELHI Head Office ?

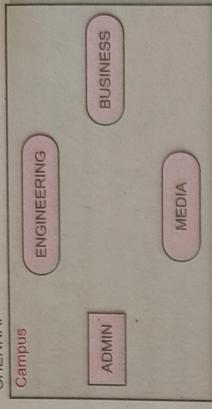
- (a) Cable TV   (b) Email   (c) Video Conferencing   (d) Text Chat

Ans.

- (i) Server should be placed in ADMIN Building, as maximum number of computers are there and therefore maximum traffic can be localized.

- (ii) Star topology (see adjacent figure)  
 (iii) Firewall  
 (iv) Video conferencing

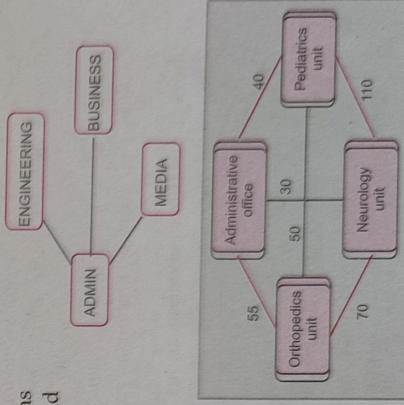
7. Ayurveda Training Educational Institute is setting up its center in Hyderabad with four specialised departments for Orthopedics, Neurology and Pediatrics along with an administrative office in separate buildings. The physical distances between these department buildings and the number of computers to be installed in these departments and administrative office are given as follows. You, as a network expert have to answer the queries as raised by them in (i) to (iv).



Number of Computers installed at various buildings are as follows :

ADMIN	110
ENGINEERING	75
BUSINESS	40
MEDIA	12
DELHI Head Office	20

[Delhi 2015]



Shortest distances between various locations in metres :

Shortest distances between various locations in metres :	
Administrative Office to Orthopedics Unit	55
Neurology Unit to Administrative Office	30
Orthopedics Unit to Neurology Unit	70
Pediatrics Unit to Neurology Unit	50
Pediatrics Unit to Administrative Office	40
Pediatrics Unit to Orthopedics Unit	110

- (i) Suggest the most suitable location to install the main server of this institution to get efficient connectivity.
- (ii) Suggest the best cable layout for effective network connectivity of the building having server with all the other buildings.
- (iii) Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following :
  - ◆ Gateway
  - ◆ Modem
  - ◆ Switch

- (iv) Suggest the topology of the network and network cable for efficiently connecting each computer installed in each of the buildings out of the following :

Topologies : Bus Topology, Star Topology

Network Cable : Single Pair Telephone Cable, Coaxial Cable, Ethernet Cable.

[CBSE Delhi 2018]

Ans.

- (i) Administration office.
- (ii) See adjacent figure
- (iii) Switch
- (iv) Topology : Star topology

Network cable : Coaxial cable or Ethernet cable

8. *Jonathan and Jonathan Training Institute* is planning to set up its centre in Amritsar with four specialised blocks for Medicine, Management, Law course alongwith an Admission block in separate buildings. The physical distances between these blocks and the number of computers to be installed in these blocks are given below. You as a network expert have to answer the queries as raised by their board of directors as given in (i) to (iv).

Shortest distances between various locations in metres :

Shortest distances between various locations in metres :	
Administrative Block to Management Block	60
Administrative Block to Medicine Block	40
Management Block to Law Block	60
Management Block to Medicine Block	50
Law Block to Medicine Block	110
	40

Number of Computers installed various locations are as follows :

Pediatrics Unit	40
Administrative Office	140
Neurology	50
Orthopedics Unit	80

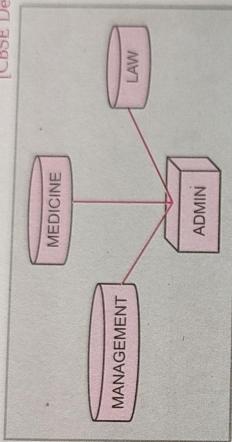
Number of Computers installed various locations are as follows :

Administrative Block	150
Management Block	70
Medicine Block	20
Law Block	50

- (i) Suggest the most suitable location to install the main server of this institution to get efficient connectivity.
- (ii) Suggest the devices to be installed in each of these buildings for connecting computers installed within the building out of the following :
- ◆ Modem ◆ Switch
  - ◆ Gateway ◆ Router

- (iii) Suggest by drawing the best cable layout for effective network connectivity of the blocks having server with all the other blocks.
- (iv) Suggest the most suitable wired medium for efficiently connecting each computer installed in every building out of the following network cables :
- ◆ Co-axial Cable ◆ Ethernet Cable
  - ◆ Single Pair Telephone Cable ◆

**Ans.** [CBSE Delhi 2019]



9. Galaxy Provider Limited is planning to connect its office in Texas, USA with its branch at Mumbai. The Mumbai branch has 3 Offices in three blocks located at some distance from each other for different operations - ADMIN, SALES and ACCOUNTS.

As a network consultant, you have to suggest the best network related solutions for the issues/problems raised in (a) to (d), keeping in mind the distances between various locations and other given parameters.

*Layout of the Offices in the Mumbai branch :*

Shortest distances between various locations :

ADMIN Block to SALES Block	300 m
SALES Block to ACCOUNTS Block	175 m
ADMIN Block to ACCOUNTS Block	350 m
MUMBAI Branch to TEXAS Head Office	14000 km

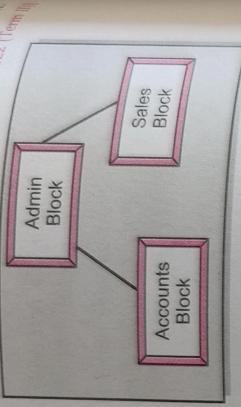
Number of Computers installed at various locations are as follows :

ADMIN Block	255
ACCOUNTS Block	75
SALES Block	30
TEXAS Head Office	90

- (a) It is observed that there is a huge data loss during the process of data transfer from one block to another. Suggest the most appropriate networking device out of the following, which needs to be placed along the path of the wire connecting one block office with another to refresh the signal and forward it ahead.
- (i) MODEM (ii) ETHERNET CARD (iii) REPEATER (iv) HUB
  - (b) Which hardware networking device out of the following will you suggest to connect all the computers within each block ?
  - (i) SWITCH (ii) MODEM (iii) REPEATER (iv) ROUTER

- (c) Which service/protocol out of the following will be most helpful to conduct live interactions of employees from Mumbai Branch and their counterparts in Texas ?  
 (iv) VoIP

- (iii) SMTP  
 (ii) FTP (i) PPP  
 (d) Draw the cable layout (block to block) to efficiently connect the three offices of the Mumbai branch [CBSE 2022 Term-I]

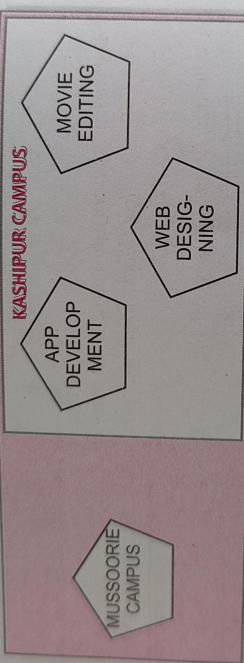


**Ans.**

- (a) Repeater  
 (b) Switch  
 (c) VoIP

(d) See adjacent figure

10. MakeInIndia Corporation, an Uttarakhand based IT Training company, is planning to set up training centres in various cities in next 2 years. Their first campus is coming up in Kashipur district. At Kashipur campus, they are planning to have 3 different blocks for App development, Web designing and Movie Editing. Each block has number of computers, which are required to be connected in a network for



communication, data and resource sharing. As a network consultant of this company, you have to suggest the best network related solutions for them for issues/problems raised in question nos. (i) to (v), keeping in mind the distances between various blocks/locations and other given parameters.  
 [CBSE SP]

Distance between various blocks/locations :

Block	Distance	Number of computers
App development to Web designing	28 m	75
App development to Movie editing	55 m	50
Web designing to Movie editing	32 m	80
Kashipur Campus to Mussoorie Campus	232 km	

- (i) Suggest the most appropriate block/location to house the SERVER in the Kashipur campus (out of 3 blocks) to get the best and effective connectivity. Justify your answer.  
 (ii) Suggest a device/software to be installed in the Kashipur Campus to take care of data security.  
 (iii) Suggest the best wired medium and draw the cable layout (Block to Block) to economically connect various blocks within the Kashipur Campus.  
 (iv) Suggest the placement of the following devices with appropriate reasons : (a) Switch/Hub (b) Repeater.  
 (v) Suggest the protocol that shall be needed to provide Video Conferencing solution between Kashipur Campus and Mussoorie Campus.

- (i) Firewall.

(ii) Ethernet Cable.

(iii) Layout : see adjacent figure.

(iv) Switch/hub will be placed in all blocks to have connectivity within the block.  
Repeater is not required between the blocks as the distances are less than 100 m.

(v) Protocol : VoIP

The diagram illustrates the network layout of Kashipur Campus. It features five interconnected hexagonal nodes arranged in a pentagonal pattern. The nodes are labeled as follows:

  - APP DEVELOPMENT**: Located at the bottom left.
  - MOVIE EDITING**: Located at the top center.
  - WEB DESIGNING**: Located at the right side.
  - CAMPUS**: Located at the top left, oriented vertically.
  - LIBRARY**: Located at the bottom right.

Each node is connected to its neighbors by lines representing network links.



11. A company ABC Enterprises has four blocks of buildings as shown on the right.

Center to center distance between various blocks :		Number of computers in each block :			
B3 TO B1	50 m	B1	150 m		
B1 TO B2	60 m	B2	15 m		
B2 TO B4	25 m	B3	15 m		
B4 TO B3	170 m	B4	25 m		
B3 TO B2	125 m				
B1 TO B4	90 m				

Computers in each block are networked but blocks are not networked. The company has now decided to

- (i) Suggest the most appropriate topology for the connections between the blocks.

(ii) (a) Ring topology      (b) Star topology      (c) Mesh topology      (d) Bus topology

(iii) The company wants internet accessibility in all the blocks. The suitable and cost-effective technology for that would be :

(a) Satellite      (b) Lease line      (c) Telephone line      (d) Broadband

(iv) Which one of the following devices will you suggest for connecting all the computers with in each of their blocks ?

(a) Switch/Hub      (b) Modem      (c) Telephone      (d) Repeater

(v) The company is planning to link its head office situated in New Delhi with the offices in hilly areas. Suggest a way to connect it economically :

(a) Coaxial cable      (b) Fiber optic      (c) Coaxial cable      (d) Radio waves

(vi) Suggest the most appropriate location of the server, to get the best connectivity for maximum number of computers.

(a) BLOCK B2      (b) BLOCK B1      (c) BLOCK B4      (d) BLOCK B3

[CBSE Question Bank 2022-23]

(vii) (a) Switch/Hub      (b) Broadband

(viii) (a) Star topology      (b) Bus topology      (c) Mesh topology      (d) Radio waves

Ans.

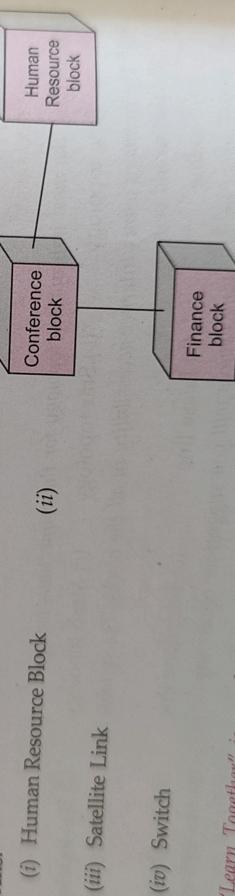
- 12.** Tech Up Corporation (TUC) is a professional consultancy company. The company is planning to set up their new offices in India with its hub at Hyderabad. As a network adviser, you have to understand their requirement and suggest them the best available solutions. Their queries are mentioned as (i) to (iv) below :

Block to Block distance  
(in m) :

Block (From)	Block (To)	Distance
Human Resource	Conference	60
Human Resource	Finance	120
Conference	Finance	80

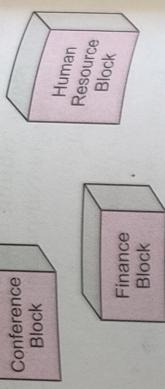
- (i) What will be the most appropriate block, where TUC should plan to install their server ?
- (ii) Draw a block to block layout to connect all the buildings in the most appropriate manner for efficient communication.
- (iii) What will be the best possible connectivity out of the following, you will suggest to connect the new setup of offices in Bangalore with its London based office ?
  - ◆ Infrared
  - ◆ Satellite link
  - ◆ Ethernet Cable
- (iv) Which of the following devices will be suggested by you to connect each computer in each of the buildings ?
  - ◆ Gateway
  - ◆ Switch
  - ◆ Modem

Ans.



- 13.** "Learn Together" is an educational NGO. It is setting up its new campus at Jabalpur for its welfare activities. The campus has 4 compounds as shown in the diagram, as per architectural drawings (in Metre) is as follows :

Main Compound to Resource Compound	110 m
Main Compound to Training Compound	115 m
Main Compound to Finance Compound	35 m
Resource Compound to Training Compound	25 m
Resource Compound to Finance Compound	135 m
Training Compound to Finance Compound	100 m



Expected Number of Computers to be installed in each block :

Block	Computers
Human Resource	125
Finance	25
Conference	60

**Expected Number of Computers in each Compound**

Main Compound	Resource Compound	Training Compound	Accounts Compound
		5	
		15	
		20	150

- (i) Suggest a cable layout of connections between the compounds.
- (ii) Suggest the most suitable place (i.e., compound) to house the server for this NGO. Also provide a suitable reason for your suggestion.
- (iii) Suggest the placement of the following devices with justification :
  - (a) Repeater
  - (b) Hub/Switch

(iv) The NGO is planning to connect its International office situated in Mumbai, which out of the following wired communication link, you will suggest for a very high speed connectivity ?

- (a) Telephone Analog Line
- (b) Optical Fiber
- (c) Ethernet Cable

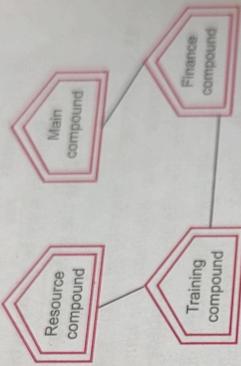
Ans.

(i) See adjacent figure

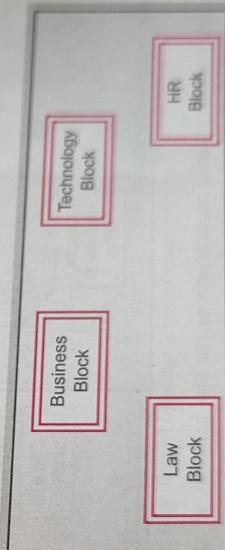
(ii) Training compound as it hosts most computers.

- (iii) (a) **Repeater.** As per one layout (shown in (i)), the repeater can be avoided as all distances between the compounds are  $\leq 100$  m.
- (b) **Hub/Switch.** Training compound as it is hosting the server.

(iv) (b) Optical Fiber.



14. MyPace University is setting up its academic blocks at Naya Raipur and is planning to set up a network. The University has 3 academic blocks and one Human Resource Center as shown in the diagram is shown on the right.



Center to Center distances between various blocks/center is as follows :

Law Block to business Block	40 m
Law block to Technology Block	80 m
Law Block to HR center	105 m
Business Block to technology Block	30 m
Business Block to HR center	35 m
Technology block to HR center	15 m

Number of computers in each of the blocks/Center is as follows :

Law Block	15
Technology Block	40
HR center	115
Business Block	25

- (a) Suggest the most suitable place (i.e., Block/Center) to install the server of this University with a suitable reason.

(b) Suggest an ideal layout for connecting these blocks/centers for a wired connectivity.

(c) Which device will you suggest to be placed/installed in each of these blocks/centers to efficiently connect all the computers within these blocks/centers.

(d) Suggest the placement of a Repeater in the network with justification.

(e) The university is planning to connect its admission office in Delhi, which is more than 1250 km from university. Which type of network out of LAN, MAN, or WAN will be formed? Justify your answer. [CBSE Sample Paper 2013]

**Ans.**

(a) Most suitable place to install the server is HR center, as this center has the maximum number of computers.

(b) See adjacent figure

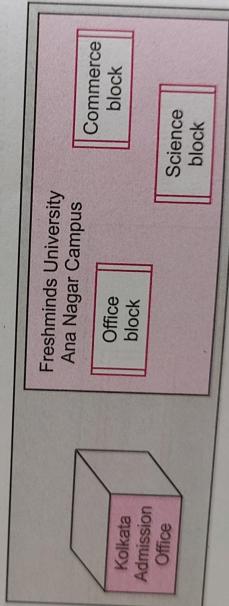
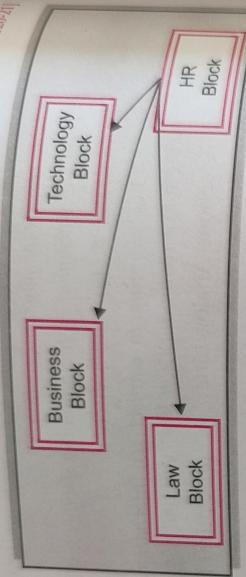
(c) Switch

(d) Repeater may be placed when the distance between 2 buildings is more than 70 meters.

(e) WAN, as the given distance is more than the range of LAN and MAN.

15. Freshminds University of India is starting its first campus in Ana Nagar of South India with its center admission office in Kolkata. The university has 3 major blocks comprising of Office Block, Science Block and Commerce Block in the 5 km area Campus.

As a network expert, you need to suggest the network plan as per (i) to (iv) to the authorities keeping in mind the distance and other given parameters.



Expected Wire distances between various locations :

Office Block to Science Block	90 m
Office Block to Commerce Block	80 m
Science Block to Commerce Block	15 m
Kolkata Admission office to Ana Nagar Campus	2450 km
Kolkata Admission office	8

Expected no. of computers to be installed at various locations in the University are:

Office Block	10
Science Block	140
Commerce Block	30
Kolkata Admission office	8

- (i) Suggest the authorities, the cable layout amongst various blocks inside university campus for connecting the blocks.
- (ii) Suggest the most suitable place (i.e., block) to house the server of this university with a suitable reason.
- (iii) Suggest an efficient device from the following to be installed in each of the blocks to connect all the computers :
  - ◆ MODEM
  - ◆ SWITCH
  - ◆ GATEWAY

(i) Suggest the most suitable (very high speed) service to provide data connectivity between Admission

- ◆ Telephone line
- ◆ Co-axial Cable Network
- ◆ Leased line
- ◆ Satellite Connection
- ◆ Fixed-Line Dial-up connection
- ◆ GSM
- ◆ Satellite Connection

Ans.

(i) See adjacent figure

- (ii) Science Block as it contains maximum number of computers.
- (iii) Switch
- (iv) Satellite Connection Or Leased line

A school library is connecting computers in its units in a LAN. The library has 3 units as shown in the diagram shown on the right.

The three units are providing the following services :

1. Teachers' Unit : For access of the library books by teachers
2. Students' Unit : For access of the library books by students
3. Circulation Unit : For issue and return of books for teachers and students

Centre to Centre distance between the 3 units are as follows :

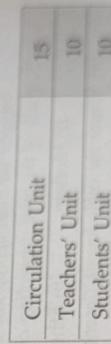
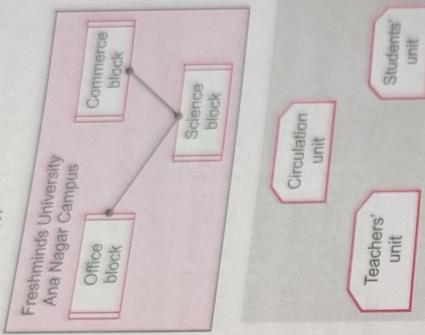
Circulation Unit to Teachers' Unit	20 m
Circulation Unit to Students' Unit	30 m
Teachers' Unit to Students' Unit	10 m

- (a) Suggest the most suitable place (i.e., the Unit name) to install the server of this Library with a suitable reason.
- (b) Suggest an ideal layout for connecting these Units for a wired connectivity.
- (c) Which device will you suggest to be installed and where should it be placed to provide Internet connectivity to all the Units ?
- (d) Suggest the type of the most efficient and economical wired medium for connecting all the computers in the network.

- (e) The university is planning to connect the Library with the School Principal's computer which is in his office at a distance of 50 metres. Which type of network out of LAN, MAN or WAN will be used for the network ? Justify your answer.

Ans.

- (i) Circulation unit as it has maximum number of computers.
- (ii) See adjacent figure.
- (iii) Modem Router in each of the units.
- (iv) Co-axial cable.
- (v) LAN - as upto 1 km, LAN is formed.



Number of computers in each of the units is as follows :



[CBSE 2021 Comp-I]

21. The government has planned to develop digital awareness in the rural areas of the nation. According to the plan, an initiative is taken to set up Digital Training Centers in villages across the country with its Head Office in the nearest cities. The committee has hired a networking consultancy to create a model of the network in which each City Head Office is connected to the Training Centers situated in 3 nearby villages. As a network expert in the consultancy, you have to suggest the best network-related solutions for the issues/problems raised in (a) to (d), keeping in mind the distance between various locations and other given parameters.

Layout of the City Head Office and Village Training Centers :

Shortest distances between various Centers :

Village 1 Training Center to City Head Office	2 km
Village 2 Training Center to City Head Office	1.5 km
Village 3 Training Center to City Head Office	3 km
Village 1 Training Center to Village 2 Training Center	3.5 km
Village 1 Training Center to Village 3 Training Center	4.5 km
Village 2 Training Center to Village 3 Training Center	3.5 km

Number of Computers installed at various centers are as follows :

Village 1 Training Center	10
Village 2 Training Center	15
Village 3 Training Center	15
City Head Office	100

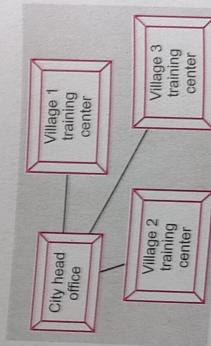
- (a) It is observed that there is a huge data loss during the process of data transfer from one village to another. Suggest the most appropriate networking device out of the following, which needs to be placed along the path of the wire connecting one village with another to refresh the signal and forward it ahead :  
 (i) Modem      (ii) Ethernet card      (iii) Repeater      (iv) Hub
- (b) Draw the cable layout (location-to-location) to efficiently connect various Village Training Centers and the City Head Office for the above shown layout.
- (c) Which hardware networking device, out of the following, will you suggest to connect all the computers within the premises of every Village Training Center ?  
 (i) Switch      (ii) Modem      (iii) Repeater      (iv) Router  
 Experts from the City Head Office and people at the three Village Training Centers ?  
 (i) FTP      (ii) PPP      (iii) SMTP      (iv) VoIP

Ans.

- (a) (iii) Repeater

- (c) (i) SWITCH

- (d) (iv) VoIP



(b)