**NSBM Green University Town**

**Data Communication and Networks CN101.3**

**Model Paper**

**Answer all questions. Total 100 Marks.**

**Time: 3 hours**

1. (a) Mention *two* reasons for layering as used in protocol architectures.

Change: When changes are made to one layer, the impact on the other layers is minimized. If the model consists of a single, all-encompassing layer, any change affects the entire model.  
  
Design: A layered model defines each layer separately. As long as the interconnections between layers remain constant, protocol designers can specialize in one area (layer) without worrying about how any new implementations affect other layers.  
  
Learning: The layered approach reduces a very complex set of topics, activities, and actions into several smaller, interrelated groupings. This makes learning and understanding the actions of each layer and the model generally much easier.  
  
Troubleshooting: The protocols, actions, and data contained in each layer of the model relate only to the purpose of that layer. This enables troubleshooting efforts to be pinpointed on the layer that carries out the suspected cause of the problem.  
  
Standards: Probably the most important reason for using a layered model is that it establishes a prescribed guideline for interoperability between the various vendors developing products that perform different data communications tasks. Remember, though, that layered models, including the OSI model, provide only a guideline and framework, not a rigid standard that manufacturers can use when creating their products.

(b)  How many layers are there in TCP/IP protocol architecture model?

5 layers

(c)  How many layers are there in ISO OSI protocol architecture model?

7 layers

|  |
| --- |
| Application |
| transport |
| network |
| Data link |
| physicial |

|  |
| --- |
| Application |
| presentation |
| session |
| transport |
| network |
| datalink |
| physical |

(d)  Show the two models in (b) and (c) by sketching a diagram showing the layers of each model side-by-side. You should label (name) the layers in your diagram.

(e)  Write *two* similarities you can see between the two models in (b) and (c).

Both model should have a physical layer to communicated with two devices

Both models should have application layer to create a message or information to communicate

(f)  Write *two* differences you can see between the two models in (b) and (c).

Tcp/ip doesn’t have session layer

Tcp/ip doesn’t have presentation layer layer

(g)  Out of the two models in (b) and (c), *which one* is widely used today?

TCP/IP

(h) Mention *two* reasons for your answer in (g).

OSI Model is a logical representation of different stages in transmission of data from source to its destination. TCP/IP is a more generalized form of OSI Model. So TCP/IP actually makes easy for us to understand things by making it more sort of "physical" instead of logical.

[Total 20 marks]

1. (a). Transmission media can be categorized into two types. What are the two types?

Guided media and unguided media

(b). Mention two examples each for above mention types.

Guided – coaxial twisted pair fiber optics

Unguided media – WIFI radio

(c). Mention two types of twisted pair cables.

Shielded twisted pair and unshielded twisted pair

(d). Write three advantages available in using optical fiber in data communication

Higher bandwidth support.

High carrying capacity.

Immunity to electromagnetic interference and tapping.

Optical fiber are so flexible .

Optical fiber cables take up less space.

Less signal attenuation.

Resistance to corrosive materials.

(e). Mention two reasons for use of parabolic dish type antennas in microwave transmission.

it has high directivity

it has highest gains meaning that it can produce the narrowest beamwidth

(f). Write two advantages and disadvantages in using microwaves for data communication.

Can be disturb by the atmosphere

can be disturb by obstacles

(g) Explain point to point and broadcast link satellite network configurations.

Point to mean two earth station and one sattalite

broadcast mean one sattilte communicate with more than two earth sation

[Total 20 marks]

1. (a). Explain what Is mean by an error in data communication.

A condition which output information doesn’t match with input information

(b). Explain single bit error and burst error using an appropriate diagram

Single bit error mean only one bit in data unit is changed from 0 to 1 or 1 to 0

Burst error mean two or more than two bits in data unit is changed from 0 to 1 or 1 to 0

(c). Explain odd parity and even parity

Odd parity check mean in parity check we send odd number of 1 including parity bit to check whether it is changed to even number of 1’s

Even parity check mean in parity check we send even number of 1s including parity bit to check whether it is changed to even number of 1’s

(d). A data transmission system uses an **even parity** error detection scheme. The transmitter transmits the following bit stream:

01011100

Due to noise in the transmission channel, the following bit stream was received by the receiver:

01011000  
(i) Identify which bit(s) is(are) in error.

(ii)  Will this error be detected by the receiver? Explain.

Yes because in even parity check we send even number of 1s and receiver receive odd number of once

(iii)  If detected, can this error be corrected by the receiver? Explain.

No receiver has to request that data packet again because receiver doesn’t know which bit has changed

(iv). Explain how the Selective Reject ARQ operates by sketching three separate timing diagrams (Similar to fig 02) under the following three scenarios

* 1. Five data frames transferred without any errors
  2. Frame 3 is lost in transit
  3. Acknowledgement from frame 5 is lost

Source Destination

Figure 2

Frame 1

[Total 20 marks]

1. (a). Name two transmission impairments in data communication.

Attenuation

Distortion

Noise

(b). Explain what is mean by Attenuation and Noise

Attenuation - **–** It means loss of energy. The strength of signal decreases with increasing distance which causes loss of energy in overcoming resistance of medium.

**Distortion –** It means change in the shape of signal. This is generally seen in composite signals with different frequencies. Each frequency component has its own propagation speed travelling through a medium. Every component arrive at different time which leads to delay distortion.

Noise- The random or unwanted signal that mixes up with the original signal

(c). What is mean by Simplex, Half duplex and Full duplex in transmission.

provide one example for each.

Simplex mean data transfer to only one side

Half duplex mean data can be transfer to both side one at a time

Full duplex mean data can be transfer to both side at same time

(c). Name two periodic wave forms.

Sinusoidal wave

Square wave

(d). What is mean by Peek amplitude and frequency in sine waves.

Peak amplitude - The maximum value of a signal or the strongest point of a sine wave

Frequency – rate at which the signal repeat

(e). A radio wave has a frequency of 1,500,000 Hz and a wavelength of

* 1. km. What is its speed?

Speed = frequency\*length

300000000ms-1

(f). A sound wave has a time period of 0.002 seconds.

What is its frequency?

Frequency = 1/t

500Hz

[Total 20 marks]

1. (a). Explain what is meant by Multiplexing and Demultiplexing.

Multiplexing is a way of sending multiple signal or stream of information over a single communication link at same time

Demultiplexing is convert receiving multiple signal or stream of information over a single communication link at same time in to a multiple signal

(b). Mention one application which use multiplexing in networking. Explain your answer.

In telecommunications, several phone calls may be transferred using one wire.

(c). Explain FDM and TDM using relevant diagrams

FDM - Frequency spectrum is divided among the logical channels and each user has exclusive access to his channel. It sends signals in several distinct frequency ranges and carries multiple video channels on a single cable. Each signal is modulated onto a different carrier frequency and carrier frequencies are separated by guard bands. Bandwidth of the transmission medium exceeds required bandwidth of all the signals. Usually for frequency division multiplexing analog signaling is used in order to transmit the signals,

TDM - Each user periodically gets the entire bandwidth for a small burst of time, i.e. entire channel is dedicated to one user but only for a short period of time. It is very extensively used in computer communication and tele-communication. Sharing of the channel is accomplished by dividing available transmission time on a medium among users. It exclusively uses the *Digital Signaling* instead of dividing the cable into frequency bands. TDM splits cable usage into time slots. Data rate of transmission media exceeds dats rate of signals. Uses a frame and one slot for each slice of time and the time slots are transmitted whether source has data or not.

(d). Explain Circuit Switching and Packet switching.

Packet switching - Within a network, packet switching break streams of data into smaller blocks of data. Each of these small blocks are then sent independently over a shared network.

**Circuit switching** is a method of implementing a telecommunications network in which two network nodes establish a dedicated communications channel (circuit) through the network before the nodes may communicate. The circuit guarantees the full bandwidth of the channel and remains connected for the duration of the communication session. The circuit functions as if the nodes were physically connected as with an electrical circuit.

(e). Explain why packet switching is more suitable for data transmission

than circuit switching

[Total 20 marks]