



الفرصة الرابعة 2019

Faculty of Electronic Engineering  
Electronic and Communication  
Department  
Forth Year  
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**Question 1 (10-12)**

**a. In your answer sheet, only put the missing word/s**

- 1- PSTN stands for: .....
- ISDN stands for: .....
- PSPDN stands for: .....
- 2- Investments in communication equipments in the network is so .....
- 3- The extent to which the network to meet the user's requirements is of .....
- 4- The capacity of the networks depends on the number of .....
- 5- Every subscriber connection to the system must be .....
- 6- The system must be will dimensioned in such a way as to be .....
- 7- The system should be able to cater for .....
- 8- The levels in the hierarchy can be linked to form the coherent world .....
- 9- The micro financial plan deal with the problems of getting the best for .....
- 10-In developing networks the selection of the correct plant ..... is important
- 11-The growth of the telecommunication network is governed by the .....
- 12-Forecasting of subscriber density growth is an essential step in .....
- 13-The total traffic is more responsive to the business activity and .....
- 14-If the annual growth is a constant percentage, the number of user increase .....
- 15-The Gompertz model caters for .....
- 16-Tandem exchange is used to route transit calls between .....
- 17-Store and forward switching method is another name of .....
- 18-.....is only one of a number of possible network protocol introduced problems
- 19-The object of a numbering plan is to allocate a .....to each subscriber
- 20-The numbering plan must consider the division of the country into areas for .....

**b. In your answer sheet only put true or false**

- 1- The international network consists of trunk exchanges
- 2- Fundamental plan involves only financial plan
- 3- Optimum network is the one designed for efficient performance only

- 4- Usually sparsely populated area contains few, small exchanges
- 5- In Densely populated areas, the subscribers have short lines
- 6- The typical provision period of sites is a bout 20-40 years
- 7- The typical provision period of numbering scheme is a bout 30 years
- 8- The typical provision period of cable duct is 20 years
- 9- The technical plans set the technical standards and detailed technical guidelines
- 10-The linear model is reasonable for a small number of years
- 11-Tandem exchange is an important economic expedient for a telephone company
- 12-A direct trunk circuit is used when there are a traffic over than 20 Erlang for busy hour
- 13-Circuit switching is a fully transparent switching technique
- 14-Delay is constant in packet switching techniques
- 15-Message switching allows interactive session between end users
- 16-Packet switching is inefficient than circuit switching
- 17-In packet switching a large storage capacity must be available at each node
- 18-Transmitting very short message as a unit is harmful in several ways
- 19-Packet switching allows simultaneous use of communication circuits
- 20-The in-band signaling is more better than the out-band signaling
- 21-One of the circuits switching advantages is that the delay is constant and prior to data transfer
- 22-In virtual circuit the channel is reserved between two users only
- 23-Circuit switching has a lower delay for small message size
- 24-Supervisory signals provide information about the state of the call

**Question 2 (6-6)**

- a- The number of subscriber lines put in services in certain exchange area during the interval 1992-1997 was registered in the following table:

year	1992	1993	1994	1995	1996	1997
Number of lines	105	110	112	115	117	120

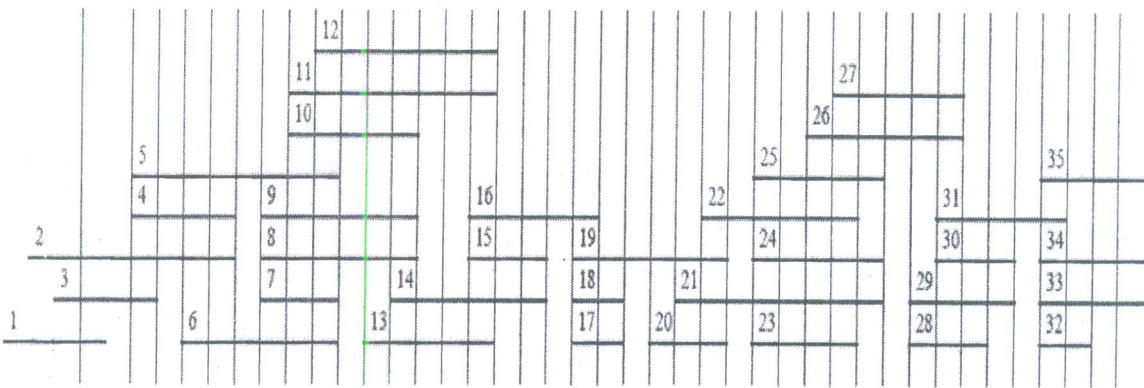
- Calculate the expected number of lines required to be connected at year 2018
- b- A message of 6000 byte is transferred through a network with 3 nodes between the sources and destination. The data rate on all links is 96 kbs, with packet size 250 bits and 50 bits as a header. The setup time is 0.2

second, with processing time at each node is 0.025 sec, while the average queuing delay at each node is 0.15 sec. the propagation speed over any link is 250 m/ $\mu$  sec, with 60 km distance between each two nodes.

Compare between circuit switching and datagram packet switching end to end delay time.

### Question 3 (12)

For the calls monitoring system shown in figure, Find the traffic intensities(offered-carried-rejected) and draw the traffic distribution for  $T=40$ , and  $N=8$



### Question 4 (6-6)

a- A certain city has an area of 1,300 square miles and is covered by a cellular system using a 7-cell reuse pattern. Each cell has a radius of 4 miles. The city is allocated 40 MHz of spectrum with a full duplex channel bandwidth of 60 kHz. Assume a GOS of 2% for an Erlang B system is specified. If the offered traffic per user is 0.03 Erlangs, compute:

- the number of cells in the service area,
- the number of channels per cell,
- traffic intensity of each cell,
- the maximum carried traffic in the system,
- the total number of users that can be served by the system for 2% GOS,
- the number of mobiles per channel, and
- the theoretical maximum number of users that could be served at one time by the system

- b- The state transitions of a private exchange with 3 channels has the following probabilities  
 $p(1)=0.2$  and  $p(2)=0.3$ . When a load of 3.48 Erlang is offered a blocking probability of 40% results, evaluate
- The probability that all channels are free
  - Average arrival rate while the average call duration is 120 second
  - Lost traffic
  - Channel utilization
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### Question 5 (6-6)

- Assuming that packets arrival at rates of 50 packets/sec. and the link speed is 64 kbps. Consider the packet length to be 1000 bits. Calculate:
  - The probability of delay of all arriving packets more than or equal 0.1 sec for M/M/1/ $\infty$ / $\infty$  system
  - The probability of delay for delayed packets to wait more than or equal 0.1 sec. for M/M/2/ $\infty$ / $\infty$  system
- A hexagonal cell within a 4-cell system has a radius of 1.387 km. A total of 60 channels are used within the entire system. If the load per user is 0.029 Erlangs, and arrival rate per user 1 call/hour, compute the following for an Erlang C system with probability of delay of 5%:
  - How many users per square kilometre will this system support?
  - What is the probability that a delayed call will have to wait for more than 10 s?
  - What is the probability that a call will be delayed for more than 10 seconds?

With my Wishes  
 Dr. Amir Salah