



القسم: الاتصالات أسئلة الامتحان النهائي لمادة: Switching and network

لطلبة الفصل: السابع والثامن رمز المادة: التاريخ: 2020/03/--

اسم الأستاذ: د. بشير الجللي الزمن: ساعتان

للفصل الدراسي: خريف 2019-2020

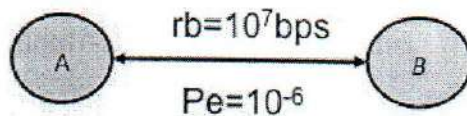
المجموعة:

رقم القيد: .....

اسم الطالب: .....

- Q1) Define local loop and trunks. [5]
- Q2) what are the common methods to extend subscriber loop beyond it's limit? [4]
- Q3) what are the disadvantages of circuit switching. [5]
- Q4) Draw block diagram of echo canceller with brief discussion of its work? [5]
- Q5) What are the key differences between datagram and virtual circuit packet switching? [5]

Q6) A file of size 2 Mbits is to be transmitted over the link AB in packet switching network as shown in figure below. If the link speed is 10Mbps, and the probability of bit errors in the link is  $10^{-6}$ .



- (a)- How many bits need to be transmitted to deliver file correctly if the file is sent all at once.
- (b)- How many bits need to be transmitted to deliver file correctly if the file is sent as packets of size 500 kbits.
- (c)- Comment on the results of (a) and (b).
- (d)- Compare the transmission delay of the above two cases in (a) and (b) ? [8]

Q9) It is required to build a time switch using multi-stage configuration STS. The first S stage is  $8 \times 8$  and the second S stage is  $8 \times 8$  with 128 channel on each link.

- a) Sketch the switch configuration and calculate the switch complexity and its blocking probability if the channel utilization is 0.3



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b) if the complexity of the STS is increased to 1029.12 due to increasing time stage sub-blocks, find the new blocking probability ( everything else stay the same) [8]

Q10) Sketch STS-1 frame with some details. [3]

Q11) Answer with yes or No. [7]

1- data stream originating at the source is divided into packets of fixed size in packet switching N. W.

2- Packet switching use store and forward technique.

3- If arrival rate is less than transmission rate of the link, queuing delay can be ignored in packet switching N. W.

4- Each packet within a stream is independently routed in datagram network.

5- In Datagram technique no routing table is required in each node.

6- Synchronous optical network ( SONET ) standardized by ITU-T

7- SONET encompasses optical and electrical specification.

Q 12) Consider a SONET ring with four station as shown in figure. Suppose that tributaries (services) are established between each pair of the station to produce a fully connected logical topology. Find the capacity required in each hop of the SONET ring assuming the ring in unidirectional and repeat If bidirectional. [10]

A- The traffic between Tripoli and Gharyan is three STS-1

B- The traffic between Tripoli and Sabha is two STS-1

C- The traffic between Tripoli and Al-jafra is one STS-1

D- The traffic between Gharyan , Sabaha and AL-jafra is one STS-1



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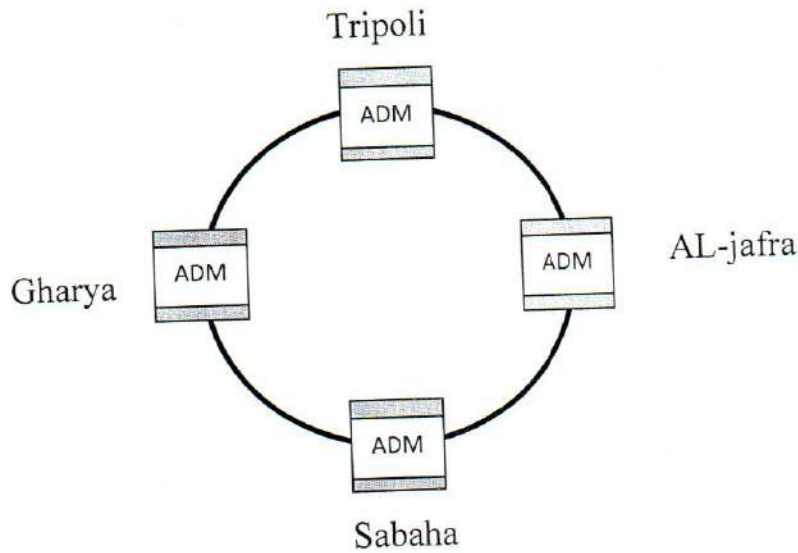


Table 10.4. Data rates for STS and STM signals

STS for SONET	OC	STM for SDH	Date rate (Mbps)
STS-1	OC-1		51.84
STS-3	OC-3	STM-1	155.52
STS-9	OC-9	STM-3	466.56
STS-12	OC-12	STM-4	622.08
STS-18	OC-18	STM-6	933.12
STS-24	OC-24	STM-8	1244.16
STS-36	OC-36	STM-12	1866.23
STS-48	OC-48	STM-16	2488.32
STS-96	OC-96	STM-32	4976.64
STS-192	OC-192	STM-64	9953.28



د. ب. ا. ك. ل. ه.

الاجابة النموذجية ( مقسمات وشبكات )

Q1) The cables that connect the telephone handsets to the local switching office is referred as subscriber loop or local loop. [2.5]

trunks that connects towns and cities and it's four-wire transmission [2.5]

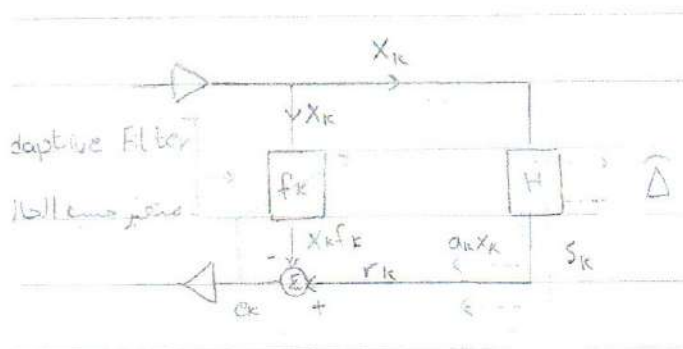
Q2) Common method for sub loop extension [4]

1- Inductive loading      2- Amplifier      3- Increase diameter

Q3) The disadvantages of circuit switching are: [5]

- Circuit establishment and circuit disconnect introduces extra overhead and delay .
- Channel capacity is dedicated for the duration of the connection even if no data is transferred
- Particularly whenever the user is not using the bandwidth that others cannot use.

Q4) [5]



11

The transmitted speech is stored for a period of time equal to the round trip delay of the circuit. The stored signal is attenuated and then subtracted from the incoming signal. This kind of circuits are available in satellite circuits.

$$r_k = S_k + a_k X_k e_k = r_k - f_k X_k = S_k + a_k X_k - f_k X_k$$

$$e_k = S_k + (a_k - f_k) X_k$$

Q5) The key differences between datagram and virtual circuit packet switching are. [5]

1- In datagram Packet can take any route but in virtual circuit All packet follow the same path.

2- In datagram No hand shaking is needed instead in virtual circuit call request and accept connection is needed ( hand shaking).

3- Packet may arrive out of order in data gram, instead packet arrival arrives in order in virtual circuit.

4- In virtual circuit No routing table is required in each node.

Q6)

a) Probability that  $2 \times 10^6$  bits arrives correctly =  $(1 - 10^{-6})^{2000000}$   
= 0.13533 [2]

So we need to transmit message 8 times per hop to deliver file correctly.

total Number of bits to be transmitted =  $8 \times 2 \times 10^6 = 16$  Mbit

b) Probability that 500 Kbits arrives correctly =  $(1 - 10^{-6})^{500000}$   
= 0.6065

So we need to transmit message 1.7 times per hop to deliver file correctly.

Number of bits to be transmitted =  $1.7 \times 500 \times 10^3 \times 4 = 3.4$  Mbit [2]

c) From a and b its clear that its better to use small packet to minimize the total number of bits need to be transmitted. [2]

d) Transmission Delay =  $L / rb = 16 \times 10^6 / 10^7 = 1.6$  sec

Transmission Delay =  $L / rb = 3.4 \times 10^6 / 10^7 * 4 = 0.34$  sec [2]

Q9)

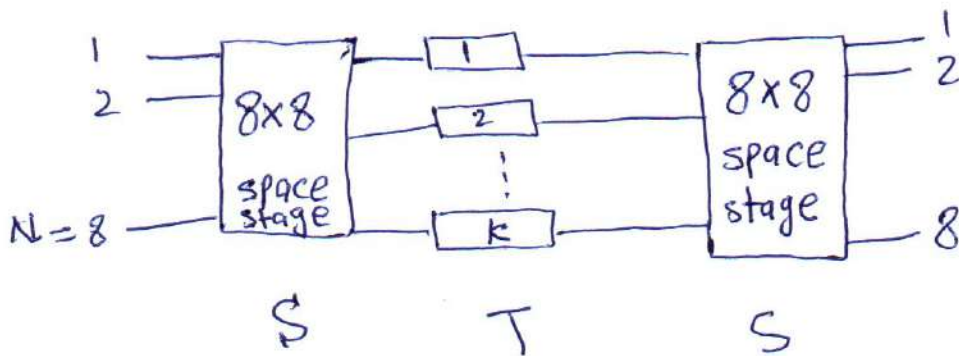
$$\text{(a) complexity} = 2kN + \frac{kC}{100} (2\log_2 N + \log_2 C)$$

$$= 2 \times 8 \times 8 + \frac{8 \times 128}{100} (2\log_2 8 + 7)$$

complexity = 343.04 Cross points

$$P_B = \left[ 1 - \left( 1 - \frac{PN}{k} \right)^2 \right]^k \quad \text{where } \beta = \frac{k}{N} = 1 \quad \text{where } P = 0.3 \quad k = 8$$

$$P_B = \left[ 1 - \left( 1 - \frac{0.3}{1} \right)^2 \right]^8 = 4.57 \times 10^{-3}$$

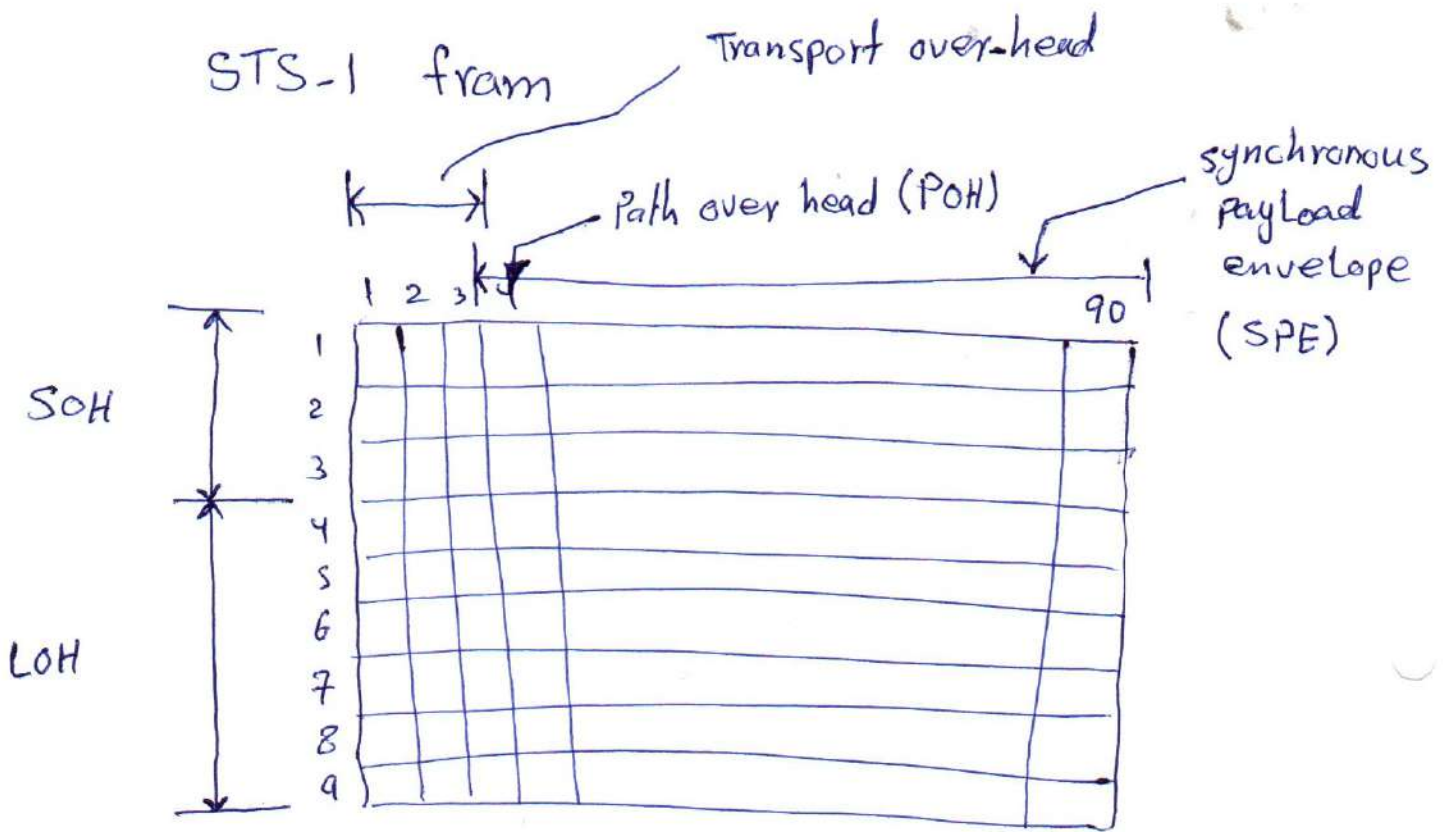


(b) if complexity = 1029.12

$$\therefore 1029.12 = 2 \times k \times 8 + \frac{128k}{100} (2\log_2 8 + 7)$$

$$\Rightarrow k = 3 \times 8 = 24$$

Q10)



$$1 \text{ frame} = 6480 \text{ bits} = 810 \text{ bytes}$$

Q11)

- 1- X
- 2- ✓
- 3- ✓
- 4- ✓
- 5- X
- 6- X
- 7- ✓

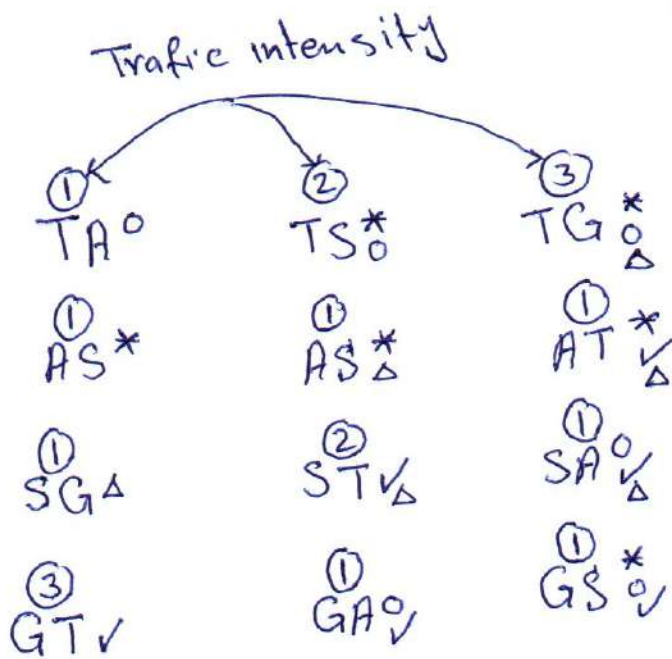
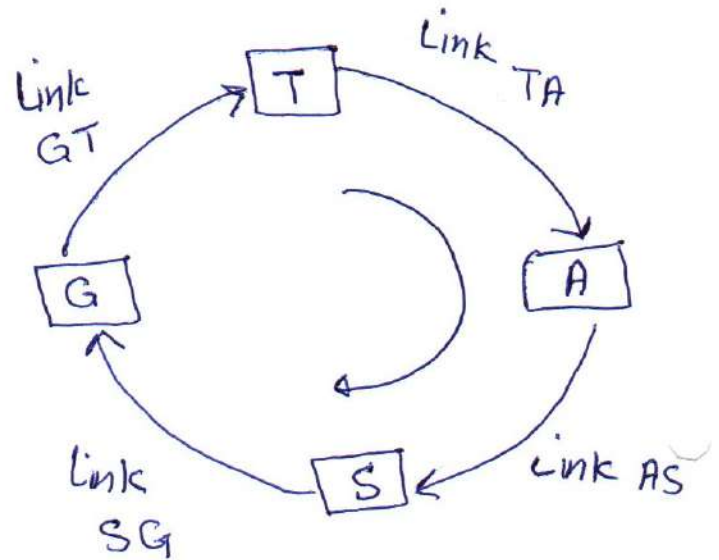
[7]



Q12)

for unidirection

[5]



$$\text{Link TA}^o = 1 + 2 + 3 + 1 + 1 + 1 = 9 \text{ STSI}$$

$$\text{Link AS}^* = 2 + 3 + 1 + 1 + 1 + 1 = 9 \text{ STSI}$$

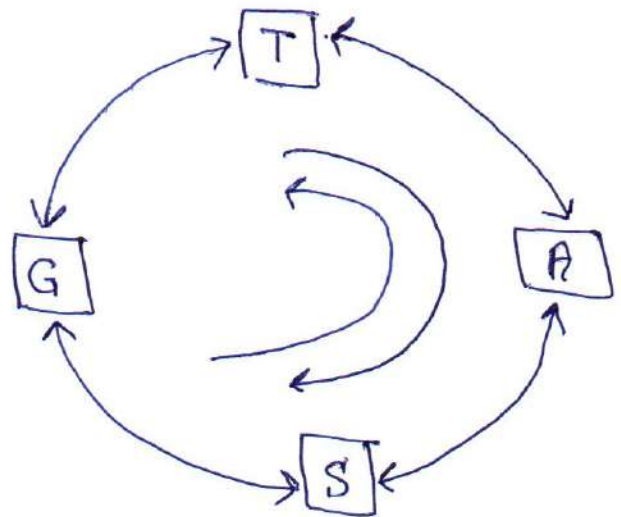
$$\text{Link SG}^\Delta = 3 + 1 + 1 + 1 + 2 + 1 = 9 \text{ STSI}$$

$$\text{Link GT}^\checkmark = 1 + 2 + 1 + 3 + 1 + 1 = 9 \text{ STSI}$$



for bidirection traffic [5]

in case of equal distance we will use clockwise direction



① TA ✓	② TS* ✓	③ TG <sup>Δ</sup>
① AS* ✓	① AG <sup>o</sup> *	① AT ✓
① SG <sup>o</sup>	② ST <sup>o</sup> Δ	① SA*
③ GT <sup>Δ</sup>	① GA <sup>Δ</sup> ✓	① GS <sup>o</sup>

Link TA ✓  $1 + 2 + 1 + 1 = 5$  STS<sub>1</sub>

Link AS\*  $2 + 1 + 1 + 1 = 5$  STS<sub>1</sub>

Link SG<sup>o</sup>  $1 + 1 + 2 + 1 = 5$  STS<sub>1</sub>

Link GT<sup>Δ</sup>  $3 + 2 + 3 + 1 = 9$  STS<sub>1</sub>

Links TA, AS, SG have 5 STS<sub>1</sub> ⇒ OC-9

Link GT have 9 STS<sub>1</sub> ⇒ OC-9