

Course Title: Telecommunication Networks
Date: 12/1/2022

Course Code: EEC 4124
Allowed time: 3 hours

Year: 4th
No. of Pages: (2)

Remarks: (answer the following questions ... assume any missing data ... answers should be supported by equations and sketches)

Question #1: Write only the missing word(s)

1. If coherence bandwidth is smaller than the bandwidth of the signal, ----- fading occurs.
2. Disadvantages of circuit switching -----, -----, -----
3. In slow fading channel, Doppler spread of the channel is much less than the -----
4. For flat fading channel, the rms delay spread of the channel is smaller than -----
5. Signaling can be classified functionally to -----, -----, and -----
6. Talk-down problem exists in ----- signaling; refers to -----, and can be avoided by -----
7. Common Channel Signaling has two modes ----- and -----
8. Robustness is defined as -----
9. The least-cost route should provide the highest -----, and minimum -----
10. In fixed routing, route may change in case of -----
11. ----- routing does not react to network congestion.
12. The principal disadvantage of flooding routing is -----, this can be prevented by -----
13. In packet switching networks, ----- routing is used.
14. Channel utilization is defined as -----
15. Poisson traffic means -----
16. For an infinite number of users, the arrival call rate is ----- and traffic is said to be -----

Question (2)

- (a) Define the following terms: time congestion, inter-arrival time, GoS, and call congestion.
- (b) During a busy hour, "A" Erlang is offered to a single channel exchange that was occupied over a time of 49 minutes. When the lost traffic is overflowed to multi-channel exchange, it was blocked during 1.2 minutes. Determine the following:
 - i. The average number of busy channels.
 - ii. The probability of finding 6 channels busy simultaneously.
(Hint: Using Erlang's table)
- (c) There are two trunk groups are used between two switching offices. The first group has 12 channels and the second group has 6 channels. If the first group; handling 64 call trials per hour with 10 minutes expected duration. What is the blocking probability of the first group? If the overflow traffic from the first group is offered to the second one; determine the blocking probability of the second group, and the probability that both groups are blocked simultaneously. Compare your result to the probability of one 18-channels trunk group. Comment clearly on your results. (Hint: use Erlang's table).

Question #3

- (a) Apply the following sentence for system "Time congestion doesn't necessitate call congestion".

- (b) Prove that, if the assumption of statistical equilibrium for traffic is achieved, the probability of the system being in state i is given in terms of the probability that it is in state 0.
- (c) Consider a single channel delay system $M/M/1$; deduce an expression for the following parameters: probability of finding j call trials, delay probability, and average number of customers in the system.
- (d) Consider a single channel packet network acts a delay system. In a busy hour, 1800 packets are offered, each of 1.2 sec service time. Calculate:
- The probability that packet is delayed.
 - The average number of packets in the network.
 - The average time spent in the network.
 - The average number of waiting time of a packet.
 - The probability that there are less than 6 packets in the network.

Question (4)

- Show the way in which cross points in a switching system can be reduced, give an example.
- Find the condition for non-blocking three stage switch (support your answer with sketch).
- Deduce an expression for the minimum number of crosspoints of non-blocking three stage switch.

Question (5)

- Consider a numbering area has a population of 1000 users. If each exchange has a capacity of 100 users, determine the following:
 - Suggest clearly in details; a numbering plan.
 - If a user in a certain area wants to phone his friend in the same area, how many digits he has to dial if there are 20 areas in the country?
 - Repeat (ii) for user's friend in another area.
- A simple network is used according to Figure 1. Suppose flooding is used to send packets from S to R.
 - If we limit the packets by a hop count limit, which is the minimum hop count necessary for a packet from S to reach R?
 - What is the total amount of packets generated in the network for this hop count? Explain your answer in details (support your answer with sketch).

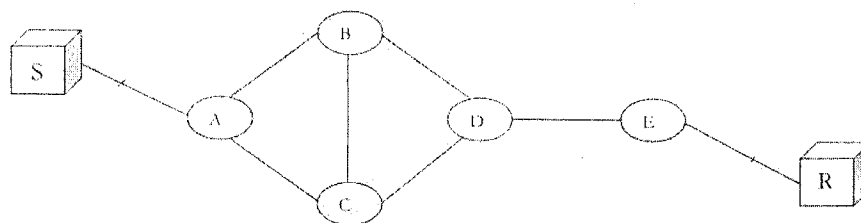


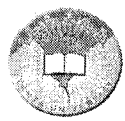
Figure 1

Erlang B Traffic Table

Maximum Offered Load Versus B and N
B is in %

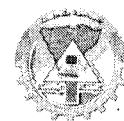
N/B	0.01	0.05	0.1	0.5	1.0	2	5	10	15	20	30	40
1	.0001	.0005	.0010	.0050	.0101	.0204	.0526	.1111	.1765	.2500	.4286	.6667
2	.0142	.0321	.0458	.1054	.1526	.2235	.3813	.5954	.7962	1.000	1.449	2.000
3	.0868	.1517	.1938	.3490	.4555	.6022	.8994	1.271	1.603	1.930	2.633	3.480
4	.2347	.3624	.4393	.7012	.8694	1.092	1.525	2.045	2.501	2.945	3.891	5.021
5	.4520	.6486	.7621	1.132	1.361	1.657	2.219	2.881	3.454	4.010	5.189	6.596
6	.7282	.9957	1.146	1.622	1.909	2.276	2.960	3.758	4.445	5.109	6.514	8.191
7	1.054	1.392	1.579	2.158	2.501	2.935	3.738	4.666	5.461	6.230	7.856	9.800
8	1.422	1.830	2.051	2.730	3.128	3.627	4.543	5.597	6.498	7.369	9.213	11.42
9	1.826	2.302	2.558	3.333	3.783	4.345	5.370	6.546	7.551	8.522	10.58	13.05
10	2.260	2.803	3.092	3.961	4.461	5.084	6.216	7.511	8.616	9.685	11.95	14.68
11	2.722	3.329	3.651	4.610	5.160	5.842	7.076	8.487	9.691	10.86	13.33	16.31
12	3.207	3.878	4.231	5.279	5.876	6.615	7.950	9.474	10.78	12.04	14.72	17.95
13	3.713	4.447	4.831	5.964	6.607	7.402	8.835	10.47	11.87	13.22	16.11	19.60
14	4.239	5.032	5.446	6.663	7.352	8.200	9.730	11.47	12.97	14.41	17.50	21.24
15	4.781	5.634	6.077	7.376	8.108	9.010	10.63	12.48	14.07	15.61	18.90	22.89
16	5.339	6.250	6.722	8.100	8.875	9.828	11.54	13.50	15.18	16.81	20.30	24.54
17	5.911	6.878	7.378	8.834	9.652	10.66	12.46	14.52	16.29	18.01	21.70	26.19
18	6.496	7.519	8.046	9.578	10.44	11.49	13.39	15.55	17.41	19.22	23.10	27.84
19	7.093	8.170	8.724	10.33	11.23	12.33	14.32	16.58	18.53	20.42	24.51	29.50
20	7.701	8.831	9.412	11.09	12.03	13.18	15.25	17.61	19.65	21.64	25.92	31.15
21	8.319	9.501	10.11	11.86	12.84	14.04	16.19	18.65	20.77	22.85	27.33	32.81
22	8.946	10.18	10.81	12.64	13.65	14.90	17.13	19.69	21.90	24.06	28.74	34.46
23	9.583	10.87	11.52	13.42	14.47	15.76	18.08	20.74	23.03	25.28	30.15	36.12
24	10.23	11.56	12.24	14.20	15.30	16.63	19.03	21.78	24.16	26.50	31.56	37.78
25	10.88	12.26	12.97	15.00	16.13	17.51	19.99	22.83	25.30	27.72	32.97	39.44
26	11.54	12.97	13.70	15.80	16.96	18.38	20.94	23.89	26.43	28.94	34.39	41.10
27	12.21	13.69	14.44	16.60	17.80	19.27	21.90	24.94	27.57	30.16	35.80	42.76
28	12.88	14.41	15.18	17.41	18.64	20.15	22.87	26.00	28.71	31.39	37.21	44.41
29	13.56	15.13	15.93	18.22	19.49	21.04	23.83	27.05	29.85	32.61	38.63	46.07
30	14.25	15.86	16.68	19.03	20.34	21.93	24.80	28.11	31.00	33.84	40.05	47.74
31	14.94	16.60	17.44	19.85	21.19	22.83	25.77	29.17	32.14	35.07	41.46	49.40
32	15.63	17.34	18.21	20.68	22.05	23.73	26.75	30.24	33.28	36.30	42.88	51.06
33	16.34	18.09	18.97	21.51	22.91	24.63	27.72	31.30	34.43	37.52	44.30	52.72
34	17.04	18.84	19.74	22.34	23.77	25.53	28.70	32.37	35.58	38.75	45.72	54.38
35	17.75	19.59	20.52	23.17	24.64	26.44	29.68	33.43	36.72	39.99	47.14	56.04
36	18.47	20.35	21.30	24.01	25.51	27.34	30.66	34.50	37.87	41.22	48.56	57.70
37	19.19	21.11	22.08	24.85	26.38	28.25	31.64	35.57	39.02	42.45	49.98	59.37
38	19.91	21.87	22.86	25.69	27.25	29.17	32.62	36.64	40.17	43.68	51.40	61.03
39	20.64	22.64	23.65	26.53	28.13	30.08	33.61	37.72	41.32	44.91	52.82	62.69
40	21.37	23.41	24.44	27.38	29.01	31.00	34.60	38.79	42.48	46.15	54.24	64.35
41	22.11	24.19	25.24	28.23	29.89	31.92	35.58	39.86	43.63	47.38	55.66	66.02
42	22.85	24.97	26.04	29.09	30.77	32.84	36.57	40.94	44.78	48.62	57.08	67.68
43	23.59	25.75	26.84	29.94	31.66	33.76	37.57	42.01	45.94	49.85	58.50	69.34

44	24.33	26.53	27.64	30.80	32.54	34.68	38.56	43.09	47.09	51.09	59.92	71.01
45	25.08	27.32	28.45	31.66	33.43	35.61	39.55	44.17	48.25	52.32	61.35	72.67
46	25.83	28.11	29.26	32.52	34.32	36.53	40.55	45.24	49.40	53.56	62.77	74.33
47	26.59	28.90	30.07	33.38	35.22	37.46	41.54	46.32	50.56	54.80	64.19	76.00
48	27.34	29.70	30.88	34.25	36.11	38.39	42.54	47.40	51.71	56.03	65.61	77.66
49	28.10	30.49	31.69	35.11	37.00	39.32	43.53	48.48	52.87	57.27	67.04	79.32
50	28.87	31.29	32.51	35.98	37.90	40.26	44.53	49.56	54.03	58.51	68.46	80.99
51	29.63	32.09	33.33	36.85	38.80	41.19	45.53	50.64	55.19	59.75	69.88	82.65
52	30.40	32.90	34.15	37.72	39.70	42.12	46.53	51.73	56.35	60.99	71.31	84.32
53	31.17	33.70	34.98	38.60	40.60	43.06	47.53	52.81	57.50	62.22	72.73	85.98
54	31.94	34.51	35.80	39.47	41.51	44.00	48.54	53.89	58.66	63.46	74.15	87.65
55	32.72	35.32	36.63	40.35	42.41	44.94	49.54	54.98	59.82	64.70	75.58	89.31
56	33.49	36.13	37.46	41.23	43.32	45.88	50.54	56.06	60.98	65.94	77.00	90.97
57	34.27	36.95	38.29	42.11	44.22	46.82	51.55	57.14	62.14	67.18	78.43	92.64
58	35.05	37.76	39.12	42.99	45.13	47.76	52.55	58.23	63.31	68.42	79.85	94.30
59	35.84	38.58	39.96	43.87	46.04	48.70	53.56	59.32	64.47	69.66	81.27	95.97
60	36.62	39.40	40.80	44.76	46.95	49.64	54.57	60.40	65.63	70.90	82.70	97.63
61	37.41	40.22	41.63	45.64	47.86	50.59	55.57	61.49	66.79	72.14	84.12	99.30
62	38.20	41.05	42.47	46.53	48.77	51.53	56.58	62.58	67.95	73.38	85.55	101.0
63	38.99	41.87	43.31	47.42	49.69	52.48	57.59	63.66	69.11	74.63	86.97	102.6
64	39.78	42.70	44.16	48.31	50.60	53.43	58.60	64.75	70.28	75.87	88.40	104.3
65	40.58	43.52	45.00	49.20	51.52	54.38	59.61	65.84	71.44	77.11	89.82	106.0
66	41.38	44.35	45.85	50.09	52.44	55.33	60.62	66.93	72.60	78.35	91.25	107.6
67	42.17	45.18	46.69	50.98	53.35	56.28	61.63	68.02	73.77	79.59	92.67	109.3
68	42.97	46.02	47.54	51.87	54.27	57.23	62.64	69.11	74.93	80.83	94.10	111.0
69	43.77	46.85	48.39	52.77	55.19	58.18	63.65	70.20	76.09	82.08	95.52	112.6
70	44.58	47.68	49.24	53.66	56.11	59.13	64.67	71.29	77.26	83.32	96.95	114.3
71	45.38	48.52	50.09	54.56	57.03	60.08	65.68	72.38	78.42	84.56	98.37	116.0
72	46.19	49.36	50.94	55.46	57.96	61.04	66.69	73.47	79.59	85.80	99.80	117.6
73	47.00	50.20	51.80	56.35	58.88	61.99	67.71	74.56	80.75	87.05	101.2	119.3
74	47.81	51.04	52.65	57.25	59.80	62.95	68.72	75.65	81.92	88.29	102.7	120.9
75	48.62	51.88	53.51	58.15	60.73	63.90	69.74	76.74	83.08	89.53	104.1	122.6
76	49.43	52.72	54.37	59.05	61.65	64.86	70.75	77.83	84.25	90.78	105.5	124.3
77	50.24	53.56	55.23	59.96	62.58	65.81	71.77	78.93	85.41	92.02	106.9	125.9
78	51.05	54.41	56.09	60.86	63.51	66.77	72.79	80.02	86.58	93.26	108.4	127.6
79	51.87	55.25	56.95	61.76	64.43	67.73	73.80	81.11	87.74	94.51	109.8	129.3
80	52.69	56.10	57.81	62.67	65.36	68.69	74.82	82.20	88.91	95.75	111.2	130.9
81	53.51	56.95	58.67	63.57	66.29	69.65	75.84	83.30	90.08	96.99	112.6	132.6
82	54.33	57.80	59.54	64.48	67.22	70.61	76.86	84.39	91.24	98.24	114.1	134.3
83	55.15	58.65	60.40	65.39	68.15	71.57	77.87	85.48	92.41	99.48	115.5	135.9
84	55.97	59.50	61.27	66.29	69.08	72.53	78.89	86.58	93.58	100.7	116.9	137.6
85	56.79	60.35	62.14	67.20	70.02	73.49	79.91	87.67	94.74	102.0	118.3	139.3
86	57.62	61.21	63.00	68.11	70.95	74.45	80.93	88.77	95.91	103.2	119.8	140.9
87	58.44	62.06	63.87	69.02	71.88	75.42	81.95	89.86	97.08	104.5	121.2	142.6
88	59.27	62.92	64.74	69.93	72.82	76.38	82.97	90.96	98.25	105.7	122.6	144.3
89	60.10	63.77	65.61	70.84	73.75	77.34	83.99	92.05	99.41	107.0	124.0	145.9
90	60.92	64.63	66.48	71.76	74.68	78.31	85.01	93.15	100.6	108.2	125.5	147.6



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Course Title	Wave Propagation and Antennas (2)	Academic Year 2021/2022 First Semester Exam	Course Code	EEC 4123
Year/ Level	Fourth year			
Date	16/1/2022	No. of Pages (2)	Allowed time	3 hrs
Remarks: (90)				

Question Number (1)

(20 Points)

(a) **Write down** the general expression of the array factor of a uniform feeding linear antenna array consisting of N antenna elements with uniform element spacing d then:

1. **State** the properties of the array factor.
2. **Design** the broadside array for maximum allowed portion of the grating lobe.

(b) **Design** a broadside array for maximum allowed portion of grating lobes and peak-side lobe to main lobe ratio is less than **0.24**.

1. Plot the corresponding array factor.
2. Estimate the **HPBW** and the directivity of the array.
3. If the array is arranged in Y-axis, and the elements are **short dipoles** oriented in **Z-direction**, plot the resultant field pattern.

Question Number (2)

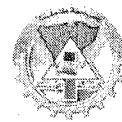
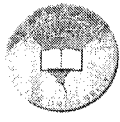
(25 Points)

(a) Consider 6 elements circular antenna array of radius $a = 2\lambda$, the array elements are dipoles oriented in Z-direction.

1. Determine the angular separation ϕ_n of the n^{th} element.
2. Plot the total field pattern of the array considering broadside direction.

(b) Consider a broadside binomial array consisting of $N = 7$ antenna elements with uniform element spacing $d = \lambda$.

1. Determine the excitation coefficients of the array elements.
2. Define and determine the DRR of the array.
3. Plot the array factor.



Question Number (3)

(20 Points)

- (a) **Define and state** the properties of the chebychev polynomials.
- (b) Design Endfire chebychev array consisting of **5** dipoles placed on X-axis that oriented towards Z- axis with uniform element spacing $d = \lambda/2$ and side lobe level = **-16 dB**.
1. Determine the excitation coefficients of the array.
 2. Plot the array factor and the total field pattern.

Question Number (4)

(25 Points)

- (a) State the advantages of planar antenna array.
- (b) Consider **6 x 4** planar antenna array having its main lobe at $\theta_0 = 90^\circ$ & $\phi_0 = 0^\circ$ where $d_x = d_y = \lambda/2$. Sketch the total field in (x-y), (x-z), and (y-z) planes if the elements of the array are dipoles oriented in X-direction.
- (c) It is desired to design rectangular microstrip patch antenna to resonate at **10 GHz** using a substrate with a dielectric constant of **4** and a height of **0.25 cm**.

Hint :

$$AF(\theta, \phi) = \sum_{n=1}^N |I_n| e^{j[\beta a \sin \theta \cos(\phi - \phi_n) - \beta a \sin \theta_0 \cos(\phi_0 - \phi_n)]}$$

$$\rho = a[(\sin \theta \cos \phi - \sin \theta_0 \cos \phi_0)^2 + (\sin \theta \sin \phi - \sin \theta_0 \sin \phi_0)^2]^{1/2}$$

$$\epsilon_{\text{reff}} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left[1 + 12 \frac{h}{W} \right]^{-1/2}$$

$$\frac{\Delta L}{h} = 0.412 \frac{(\epsilon_{\text{reff}} + 0.3) \left(\frac{W}{h} + 0.264 \right)}{(\epsilon_{\text{reff}} - 0.258) \left(\frac{W}{h} + 0.8 \right)}$$

$$\theta_{h,1,2} = \cos^{-1} \left[\cos \theta_0 \pm 0.443 \frac{\lambda}{Nd} \right]$$

Good Luck

Dr. Nessim Mahmoud



9. What does it mean that a function H is "collision resistant"?

- It is easy to compute $h = H(M)$ for any message M .
- Given h , it is infeasible to find x such that $H(x) = h$.
- Given x , it is infeasible to find y such that $H(y) = H(x)$.
- It is infeasible to find any x, y such that $H(y) = H(x)$.

10. Insertion of messages into the network from a fraudulent source is a ----- attack.

- masquerade
- spoofing
- denial of service
- source repudiation

11. DSS is a ----- technique.

- public key
- symmetric key
- timestamp
- antivirus

12. Key distribution often involves the use of _____ which are generated and distributed for temporary use between two parties.

- session keys
- public key certificates
- private key certificates
- master keys

13. Which infrastructure has the principal objective to enable secure, convenient and efficient acquisition of public keys.

- PKI
- CRL
- KDC
- Kerberos

14. PGP provides authentication through the use of -----.

- radix - 64
- asymmetric block encryption
- digital signatures
- symmetric block encryption

15. Which attacks make computer systems inaccessible by flooding servers, networks, or even end user systems with useless traffic so that legitimate users can no longer gain access to those resources?

- Brute force attack
- Flooding attacks
- Denial of service attack
- Spoofing attacks

16. is a technique or mechanism used to compromise an information asset.

- Attack
- Threat
- Exploit
- Vulnerability

17. is an attack on authentication.

- Interruption
- Fabrication
- Modification
- Interception

18. Passive attacks focus on

- detection
- prevention
- recovery
- correction



Course Title	Elective Course (3) (Data Security)	Academic Year 2021/2022 First Semester Exam	Course Code	EEEC4126
Year/Level	Fourth	No. of Pages (4)	Total Marks	(85) Marks
Date	23-1-2022	Allowed time		3 hrs

Question Number (1)

(20 Points)

Choose the best answer to complete the sentences:

- A way to improve on the simple monoalphabetic technique is to use different monoalphabetic substitutions as one proceeds through the plaintext message. The general name for this approach is:
 - polyalphabetic cipher
 - polyanalysis cipher
 - rail fence cipher
 - multiple cipher
- What is the block cipher structure in DES?
 - SAC
 - Shannon
 - Feistel
 - One Way Permutation
- The greatest common divisor of two integers is the largest positive integer that exactly divides both integers.
 - squares
 - multiplies
 - add
 - divides
- The main reason why Triple-DES was not kept as the only standard for block ciphers and have been replaced by AES is that-----
 - it has too short key
 - it has too long key
 - it is old
 - it is slow
- What is the term used for the secret key for symmetric encryption that is generated for use for a short period of time?
 - stream key
 - session key
 - master key
 - sequence key
- If p is prime and a is a positive integer, then $a^p = a \pmod p$ is an alternative form of which theorem?
 - Miller's
 - Euler's
 - Fermat's
 - Shannon's
- The key exchange protocol is vulnerable to a ----- attack because it does not authenticate the participants.
 - chosen ciphertext
 - man-in-the-middle
 - side channel
 - replay
- SHA-1 produces a hash value of ----- bits.
 - 64
 - 128
 - 160
 - 256



(15 Points)

2. A DH-based key exchange protocol for wireless mobile networks was proposed by Park. The system has a common prime modulus p and a generator g . Each party i has a long-term private key $x_i \in \mathbb{Z}_{p-1}$ and a public key $X_i = g^{x_i} \pmod{p}$. To establish a session key between a mobile subscriber M and a base station B , the following protocol is executed (with all arithmetic in \mathbb{Z}_p):

1. $R \rightarrow M : g^{x_B + N_B}$
2. $M \rightarrow B : N_M + x_M$

where N_B and N_M are one-time random noises (once used random numbers). B calculates the session key as

$$K_{MB} = (g^{x_M + N_M} X_M^{-1})^{N_B}$$

and M calculates it as

$$K_{MB} = (g^{x_B + N_B} X_B^{-1})^{N_M}$$

Then they complete the authentication with a challenge-response using this K_{MB} .

- a. Show that the Park's protocol is correct in the sense that B and M calculate the same K_{MB} value.
- b. In fact, this protocol can be broken without having any previous session keys compromised. Show how the attacker can impersonate B by just knowing his public key.
- c. Compare with drawing between three different methods of a challenge-response authentication using the shared secret key K_{MB} .

End of questions.....

Examination Committee

Assist. Prof. Dr./ Ranyat Ismail (Coordinator of the Course)

Prof. /Moustafa Mahmoud

Tr./ Nancy Alshar

Dr./ Neissem Mohamady



19. In brute-force attack, with a key length of n bit, the attacker will succeed in discovery of the key after tryingkey.
 - a. 2^n
 - b. 2^{n-1}
 - c. 2^{2n}
 - d. n^2
20. Each round in DES has a sub-key of length..... enters as input to XOR function.
 - a. 64 bit
 - b. 56 bit
 - c. 48 bit
 - d. 16 bit

(45 Points)

Question Number (2)

1. Define the following terms:

[Computer Security-Worm-Risk- Integrity]

2. Encrypt the following message: "good luck" with Caesar cipher. (6 Points)
3. For RSA: (10 Points)

- a. What is the danger in choosing 2 as the public key e in RSA?
- b. Eve uses RSA to send a message to Bob, using Bob's public key. Later, at a cocktail party, Eve sees Bob and asks him if the message has arrived and Bob confirms it. After a few drinks, Eve asks Bob, "What was the ciphertext?" Bob gives the value of the ciphertext to Eve. *Can this endanger the security of Bob's private key?*

Explain your answer.

(10 Points)

4. For Hash function: (10 Points)
 - a. How can we use it to achieve only integrity? Is it secure in this case?
 - b. How can we use it to achieve authentication? (6 Points)
5. Compare between PGP and SSL protocols. (5 Points)
6. What is IP spoofing? How can we protect our network against it using IPSec Protocol? (5 Points)

Question Number (3)

(20 Points)

1. The following protocol is designed to achieve mutual identification between A and B using a shared secret key K_{AB} : (5 Points)

1. $A \rightarrow B : A.N_A$
2. $B \rightarrow A : E_{K_{AB}}(A.N_A.N_B)$
3. $A \rightarrow B : E_{K_{AB}}(N_B.N_A)$

The attacker knows all the details of the protocol implementation and is capable of observing transmitted data. Assume now that encryption is performed using ECB mode of encryption, that is each message block $A.N_A.N_B$ is encrypted separately. Does this mode of encryption provides a secure identification scheme. Motivate your answer.

Answer all the following questions:

Question No. 1 : (37) Marks

- a- The borders of a certain country can be roughly represented by a triangle with coordinates 29°E, 33.5°N; 43.5°E, 37.5°N; 48.5°E, 30°N. If a geostationary satellite has to be visible from any point in the country, determine the limits of visibility (i.e., the limiting longitudinal positions for a satellite on the geostationary arc). Assume a minimum angle of elevation for the earth station antenna of 5°. (10) Marks
- b- A satellite has the following parameters: perigee height of 197 Km, apogee height of 340 Km, period 88.2 minutes, inclination of 64.6°. Calculate: (15) Marks
1. Semi-major axis and eccentricity,
 2. Mean motion,
 3. Rate of regression of nodes and rate of rotation of line of apsides.
- c- Discuss (briefly) each of the following: (12) Marks
1. GDOP term in GPS systems and how it can affect the accuracy of GPS receivers (sketch).
 2. The different steps (briefly) of how GPS works (sketch if possible).

Question No. 2 : (25) Marks

- a- For a radio wave of a frequency 12 GHz, the total rain attenuation is exceeded for 0.01 percent of the time in any year, for a point rain rate of 10 mm/h. Assume the earth station altitude is 600 m, the antenna elevation angle is 50° and the rain height is 3 Km. Determine (aided with the table): (6) Marks
1. The total rain attenuation for horizontally, vertically and circularly polarized signals.
 2. Compare between atmospheric attenuation, absorption and scintillation.

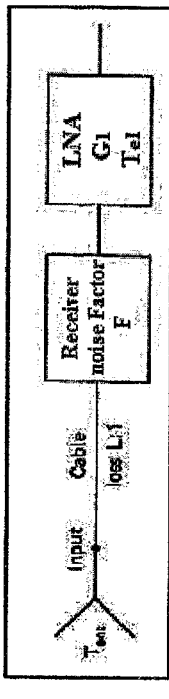
TABLE 4.2 Specific Attenuation Coefficients

Frequency, GHz	a_r	a_v	a_c	b_r	b_v	b_c
1	0.000387		0.000352	0.912		0.88
2	0.00154		0.00138	0.963		0.923
4	0.0066		0.00591	1.121		1.075
6	0.0175		0.0155	1.308		1.265
7	0.0301		0.0265	1.332		1.312
8	0.0454		0.0395	1.327		1.31
10	0.0101		0.00887	1.276		1.264
12	0.0188		0.0168	1.217		1.2
15	0.0367		0.0335	1.154		1.128
20	0.0751		0.0691	1.099		1.065
25	0.124		0.113	1.061		1.03
30	0.187		0.167	1.021		1

- b- A transponder is a basic block in any satellite system: (14) Marks
1. What is a transponder?
 2. What is the number of transponders, the bandwidth of each transponder in C-band?
 3. Sketch the communication link from receive antennas to transmit antennas in a basic transponder and mention (only) the basic function of each block.
 4. How can we double the number of operating transponders for the same bandwidth?
- c- Sketch only, with full details on the sketch, the block diagram of home TVRO system. (5) Marks

Question No. 3 : (36) Marks

- a- For the system shown below, the receiver noise figure is 12 dB, the cable loss is 5 dB, the LNA gain is 50 dB, and its noise temperature is 150 K. The antenna noise temperature is 35 K. (14) Marks
1. Calculate the noise temperature referred to the input of the system (comment on the result!).
 2. Is this the optimal system arrangement? If not, rearrange the system for optimal operation (validate your answer!).
 3. Mention three advantages for Inter-Satellite Links.



- b- Compare (aided with sketch and formulas if possible) the reason for using input back-off for satellite uplink and output back-off for satellite downlink. (8) Marks
- c- A satellite on a range of 42,000 km from a ground station is operating at 6 GHz and has receiver feeder losses of 1.5 dB, atmospheric absorption loss of 0.5 dB, antenna pointing loss of 0.5 dB, and depolarization loss due to a Faraday rotation angle of 4°. (14) Marks
1. Calculate the total link loss in [dB].
 2. If a 3-m parabolic receive antenna is used with aperture efficiency of $\eta = 0.55$ and an EIRP of 56 dBW. Calculate the received power in [dBm].
 3. Calculate carrier to noise spectral density and carrier to noise ratio at receiver if the noise temperature is 185 K and bandwidth is 36 MHz (State the units).

Question No. 4 : (27) Marks

2- Fill in the following statements with the best answer: (6) Marks

1. GPS is a constellation of satellites of type located at altitude of around (6) Marks
 2. A number of measurements (ranges) are needed to determine exact position using GPS and the precise clock used in satellite is called (6) Marks
 3. There are two types of signals are transmitted by GPS system which are: and and two types of carrier frequencies which are: and (6) Marks
 4. Three alternative satellite navigation systems for classic GPS system are: and (6) Marks
- b- Give a brief definition (aided with sketch when possible) for the following terms: (8) Marks
1. Prograde orbit
 2. Right ascension of the ascending node
 3. Sun-synchronous orbit
 4. Earth eclipse of satellite

- c- Explain the basic functions of TTTC&M subsystem in a satellite system. (7) Marks
- d- What is the maximum earth station latitude that can see a geostationary satellite assuming a minimum elevation angle of 5°? (6) Marks

Constants

You may use the following

- $a_{Geo} = 42164 \text{ Km}$
- $\mu = 3.986005 \times 10^{14} \text{ m}^3/\text{s}^2$
- $K_1 = 66053.1704 \text{ Km}^2$
- $R_E = 6378.1414 \text{ Km}$
- $K = 1.38 \times 10^{-23} \text{ J/K}$
- $T_0 = 290 \text{ K}$
- $c = 3 \times 10^8 \text{ m/s}$

Formulas

- $n = n_0 \left[1 + \frac{K_1(1 - 1.5 \sin^2 i)}{a^2(1 - e^2)^{1.5}} \right]$
- $\frac{d\Omega}{dt} = -K \cos i$
- $a \cong a_0 \left[\frac{n_0}{n_0 + n_0(t - t_0)} \right]^{\frac{2}{3}}$
- $\tan \frac{v}{2} = \sqrt{\frac{1+e}{1-e}} \tan \left(\frac{E}{2} \right)$
- $M = (E - e \sin E)$
- $b = \cos^{-1}(\cos B \cos \lambda_E)$
- $EL = \cos^{-1} \left(\frac{R_{Geo}}{a} \sin b \right)$
- $r_{0,001} = \frac{90}{10 + L_G}$
- $r_{0,01} = \frac{90}{90 + 4L_G}$
- $G = \eta \left(\frac{\pi D}{\lambda} \right)^2$
- $K = \frac{nK_1}{a^2(1 - e^2)^2}$
- $\frac{d\omega}{dt} = K(2 - 2.5 \sin^2 i)$
- $r = \frac{a(1 - e^2)}{1 + e \cos v}$
- $r = a(1 - e \cos E)$
- $v \cong M + 2e \sin M + \frac{5}{4}e^2 \sin 2M$
- $A = \sin^{-1} \left(\frac{\sin |B|}{\sin b} \right)$
- $[AA] = [AA]_{90} \operatorname{cosec}(EL)$
- $r_{0,1} = \frac{180}{180 + L_G}$
- $r_1 = 1$

<<Good Luck>>

Assoc. Prof. Mahmoud Selim (Course Coordinator)



Total Marks: 40 Marks

Course Title: Project Management

Year : 4th year

Date : 2/2/2022

Allowed time: 2 Hours

Number of pages: 5

السؤال الاول:

أكثر الإجابات الصحيحة: (10 درجات)

1- هي علم وفن يحتاج إلى كفاءة عالية للممارسة العمل في جو من التفاهم والوعي والاحترام المتبادل .

- (a) الكفاءة
- (b) الإدارة
- (c) المشروع
- (d) الخبرة

2- يعتبر المشروع نظاماً يؤثر ويتأثر بالبيئة المحيطة.

- (a) مفتوحاً
- (b) مغلقاً
- (c) محدوداً
- (d) جميع ما سبق

3- يتحقق الجانب عن طريق الأبحاث والدراسات والتطبيقات .

- (a) العلمي
- (b) الفني
- (c) الكفاءة

(d) جميع ما سبق

4- التعامل مع العنصر البشري في بيئة تتفاعل مع العديد من المتغيرات يكون للتقدير والحكم الشخصي بعد هذا من الجانب

..... في العملية الإدارية .

- (a) الفني
- (b) الخبرة
- (c) الكفاءة
- (d) أ، ب، معاً

5- المشروع الناجح هو الذي ينتهي بعد تحقيقي متطلباته وفقاً ل.....

- (a) الوقت المحدد
- (b) التكلفة المحددة

(c) الجودة المطلوبة

(d) جميع ما سبق

6- هو كل ما يتعلق بالجانب الزمني لإنجاز المشروع .

(a) مخطط المشروع

(b) خطة المشروع

(c) جدول المشروع

(d) موازنة المشروع

7- هو كل ما يتعلق بالجانب المالي للمشروع.

(a) مخطط المشروع

(b) خطة المشروع

(c) جدول المشروع

(d) موازنة المشروع

8- هو الفرق بين كمية المال في نهاية الفترة وكمية المال في بداية الفترة.

(a) معدل الفائدة

(b) الفائدة

(c) الفائدة المدفوعة

(d) الفائدة المكتسبة

9- قيمة أو مقدار المال في بداية الفترة.

(a) القيمة الابتدائية

(b) القيمة النهائية

(c) الأقساط السنوية

(d) التدرج الحسابي

10- قيمة أو مقدار المال في نهاية الفترة.

(a) القيمة الابتدائية

(b) القيمة النهائية

(c) الأقساط السنوية

(d) التدرج الحسابي

11- عرض مقدم من المقاول للمالك يطلب فيه تنفيذ العمل عند سعر معين طبقاً لمستندات العطاء.

(a) العطاء

(b) المناقصات

(c) المشروع

(d) الخطة

18- هو اعتماد البنك على بند آخر ولا يبدأ إلا بانتهاء البند الآخر.

- (a) نشاط حاسم
- (b) السلف
- (c) نشاط غير حاسم
- (d) التكلفة المتوقعة

19- هو البند الذي إذا تأخر لا يؤدي لتأخير المشروع.

- (a) نشاط حاسم
- (b) السلف
- (c) نشاط غير حاسم
- (d) التكلفة المتوقعة

20- تكلفة البنك خلال فترة زمنية معينة.

- (a) نشاط حاسم
- (b) السلف
- (c) نشاط غير حاسم
- (d) التكلفة المتوقعة

السؤال الثاني:

10 درجات

ضع علامة صح أو خطأ.

- 1- لا يوجد علاقة بين الإدارة الناجحة وطبيعة موقع العمل والعمالين.
- 2- يساعد تسويق وتوظيف كافة الموارد المادية والبشرية بكفاءة في تحقيق أهداف الشركة.
- 3- يجب أن تكون الشركة دائما في حالة اتزان ديناميكي مع المتغيرات الداخلية فقط لتحقيق أهداف الشركة.
- 4- يتحقق الجانب الفني عن طريق الأبحاث والدراسات والتطبيقات.
- 5- تعتبر التكلفة من العوامل الخارجية التي تؤثر على العملية الإدارية.
- 6- العوامل القانونية أحد العوامل الخارجية التي تؤثر على العملية الإدارية.
- 7- الإدارة تعمل على تقادي الخسارة وزيادة الأرباح.
- 8- يجب الالتزام بالنطاق المحدد لكي يعتبر المشروع ناجح.
- 9- تجاوز التكلفة يؤدي إلى فشل المشروع.
- 10- تتعلق المخاطر بالوقت والتكلفة والمواصفات المحددة فقط.
- 11- مدير المشروع هو الشخص أو المنظمة التي يتم تنفيذ المشروع لصالحها.
- 12- الزبون هو كافة الجهات التي تقوم بتزويد المشروع بالموارد المادية والبشرية لإتمام المشروع.
- 13- الإدارة العليا هي الطاقم الوظيفي الذي يعمل في المشروع.

12- المرحلة الثالثة من دورة المشروع والتي تتم بطريقة اختيار المالك المقبول المميز وفي بعض الأحيان يحدد مدير المشروع.

- (a) العطاء
- (b) المناقصات
- (c) المشروع
- (d) الخطأ

13- مناقصة مفتوحة لكل المقاولين والذين تطبق عليهم الشروط وغالبا ما تحدث في الأعمال الحكومية.

- (a) مناقصة عامة
- (b) مناقصة اختيارية
- (c) مناقصة تفويض
- (d) مناقصة إسناد

14- عمل قائمة بالمقاولين ذوي الكفاءة العالية وذلك لضمان أعلى كفاءة في التنفيذ لتقليل الوقت اللازم للتقييم.

- (a) مناقصة عامة
- (b) مناقصة اختيارية
- (c) مناقصة تفويض
- (d) مناقصة إسناد

15- يتم الدعوة إلى المناقصة من خلال إرسال خطابات إلى عدد من المقاولين يتفق بهم المالك ويكون العدد من

5-3 .

- (a) مناقصة عامة
- (b) مناقصة اختيارية
- (c) مناقصة تفويض
- (d) مناقصة إسناد

16- يتم فيها الاتفاق مع المقاول على مرحلة واحدة من مراحل المشروع وعند النجاح بها يتم ترشيحه للمراحل القادمة.

- (a) مناقصة عامة
- (b) مناقصة اختيارية
- (c) مناقصة تفويض
- (d) مناقصة إسناد

17- هو البند الذي إذا تأخر يؤدي لتأخير المشروع.

- (a) نشاط حاسم
- (b) السلف
- (c) نشاط غير حاسم
- (d) التكلفة المتوقعة

- 14- تسمى الفائدة عند استثمار مبلغ من المال بالفائدة المدفوعة.
- 15- القيمة الابتدائية والقسط الأول يتم دفعهم في نفس الفترة.
- 16- من مميزات المناقصة العامة (منع المحاباة).
- 17- من عيوب المناقصات العامة دفع المقاول إلى تقليل الجودة إذا كان السعر أقل من السعر الطبيعي.
- 18- من مميزات المناقصة الاختيارية (اختيار مقاول بعينه).
- 19- من عيوب المناقصة الاختيارية (تمكين المقاول من تحقيق ربح مرغوب).
- 20- من مميزات مناقصة التفويض (السرعة في بدء التنفيذ).

(20 درجة)

السؤال الثالث:

- 1- إذا قمت باستثمار 1000 دولار لمدة 3 سنوات بمعدل فائدة سنوية 6%. ما هو مقدار المال الذي سوف تحصل عليه في نهاية الفترة.
- 2- ما هو مقدار المال اللازم ليتم دفعه الآن الذي يكافئ قسط سنوي 600 دولار لمدة 9 سنوات يبدأ العام القادم بمعدل فائدة 16% لكل سنة؟
- 3- يريد رئيس شركة فورد موتور معرفة القيمة المستقبلية المكافئة لـ 1000 دولار من رأس المال المستثمر كل عام لمدة 8 سنوات ، تبدأ بعد عام واحد من الآن. بمعدل فائدة 14% في السنة
- 4- ما هو مقدار المال المتواجد في حسابك بعد 8 سنوات إذا قمت بإيداع 200 دولار سنويا بمعدل فائدة 15% بعد عام من الآن؟
- 5- تخطط عائلة للبدء في ادخار المال عن طريق إيداع 1000 جنيه في حسابها بعد عام من الآن. ويقدر أن الودائع يمكن أن تزيد بمقدار 100 جنيه كل عام لمدة 9 سنوات بعد ذلك. ما هي القيمة الحالية للاستثمارات عند 18%؟

With Best Wishes

Dr. Salah Khamis