University	: Menoufia		Date : 11/06/2016
Faculty	: Electronic Engineering		Time : 1.5 Hours
Department	: Electronics & Electrical Communications Eng.		No. of pages : 1
Academic level	: Fourth Year		Full Mark : 50 Marks
Course Name	: Laboratory Tests		Exam : Final 2nd Term
Course Code	: ECE 426		Examiner : Dr: A. Bahnacy

Part 1

برجاء إجابة الجزء الاول من ناحية والجزء الثاني من ناحية أخرى في كراسة الإجابة

Answer all the following questions :

Question No 1: **(18 Marks)**

a) Explain with the aid of drawing the construction and the Idea of operation of a two- hole waveguide directional coupler. (6 Marks)

b) For a directional coupler define: **i)** Coupling coefficient **ii)** Directivity (6 Marks)

c) In an experiment of measuring the voltage standing wave ratio (VSWR) of a load using directional coupler, the forward current measured at the coupled port was I_F=4mA and the reverse current measured at the coupled port was I_R=1mA. Calculate VSWR. (6 Marks)

Question No 2 : **(20 Marks)**

a) For an antenna Define:
Radiation pattern - Directivity - Radiation resistance - Polarization. (8 Marks)

b) Describe an experiment to measure the H-plane radiation pattern of pyrmidal horn antenna using two identical horns. (6 Marks)

c) In an experiment of measuring the gain of horn antenna using two identical horns, the transmitted power was P_T=2mW, the received power was P_R=0.05mW, the separation between the two horns was r=0.5m, and the operating frequency was f=10GHz. Calculate the gain of the horn antenna. (6 Marks)

Question No 3 : **(12 Marks)**

a) What are the main components of satellite communication system?. What is the function of each component?. (6 Marks)

b) Describe an experiment to realize transmitting and receiving of voice signal through satellite link. (6 Marks)

مع أطيب الامنيات بالنجاح والتفوق

QUESTION V: (12 Mark)

1) Discuss the biomedical scanning mechanisms microscopy for:
   i) Proximal scanning ii) Mechanical piezoelectric iii) MEMS mirror
2) What are the types of the biomedical endoscope optics
3) Draw and explain the photon transport in tissue
4) Describe the bidirectional Raman amplifiers;;

QUESTION VI: (16 Mark)

1) A multi mode step index fiber with a core diameter 80 μm and relative index difference of 1.48%. Find
   i) the normalize frequency ii) the number of guided modes.
   for operating wavelength 0.85 μm
2) KDP crystal is used as an electro optic amplitude modulator of a modulation voltage signal $v = v_m \sin \omega_m t$. The ratio of the output laser intensity I_o and the input laser intensity I_i is: $I_o / I_i = \sin^2 \frac{\Gamma}{2}$

   with Γ = total retardation $= \frac{\pi}{2} + \Gamma_m \sin \omega_m t$ and $\Gamma_m = \frac{\pi v_m}{v_\pi}$, v_π is constant

   Prove that the modulator is linear under the condition $\Gamma_m << 1$
3) In an optical communication system, the transmitted power may be either 0.1 mW or 0.01 mW and the received power may be either 10^{-18} or 10^{-19} watt. The receiver losses+ the transmitter losses are respectively either 130 dB or 120 dB. the fiber losses is 2 dB/km. the bit rate of the system is : $B = \frac{6.4 \times 10^2}{5 + 1.5L}$ GBit / sec

   where L is the repeater span. what is the largest number of telephone calls that may be transmitted if the system quantizer has a 256 levels.
   In the above system it is requires to multiplex 50 television program plus the telephone calls, what is the number of levels of the new quantizer?
4) The optical bandwidth B_{opt} and the pulse broadening due to dispersion τ via the relation:

   $B_{opt} . \tau = 0.44$

   The input pulse width τ_i and the output pulse width τ_o are given as :

   $\tau_o^2 = \tau_i^2 + (\tau L)^2$

   where L is the fiber length . Based on the following measurements:

	τ_i	τ_o	L
MF	400 ps	31.20 ns	1.13 km
MF	200 ps	425 ps	2.35 km

   Calculate the optical bandwidth in each case.

مع أطيب تمنياتي لكم بالنجاح والتوفيق

أ.د./ عبد الناصر عبد الجواد محمد

ANSWER THE FOLLOWING QUESTIONS:

QUESTION I : (10 Mark)

1) Write short account on the following:
   i) Optical electrical amplifiers ii) All optical amplifiers
2) Compare between the following:
   i) WDM ii) CWDM iii) DWDM iv)UW-DWDM
   For the items: a) Numbers of channels and users b) Transmission bit rate
3) What are the types of the optical transmission techniques
4) From the following data: $g = g_o + g_m \cos\pi\left(\frac{T-80}{120}\right)\cos 2\pi\left(\frac{\lambda-1530}{80}\right)$, where :
   g_o=30 dB and g_m=5 dB., $-40.0 \le T, ^oC \le 80$, and $1530 \le \lambda, \mu m \le 1610$.
   How to design the relation between gain of the amplifier and optical wavelengths

QUESTION II : (10 Mark)

1) Compare between EDFAs and Raman amplifiers for the following:
   i) Gain ii) The range of the optical wavelengths can be amplified
   iii) Pump powers iv) transmission distance
2) Draw the graphical presentation of flattened gain optical amplifier
3) Explain the Soliton technique with showing the dispersion effect and nonlinearity effect
4) In an optical communication system the following characteristics are found for L=25 km.

$\tau(\text{chromatic dispersion}) = 500(\lambda - 6.25\lambda^{-3})$ $\sigma(\text{total losses}) = \lambda^{-4} + 0.25\lambda^{2}$

$$B(\text{bit rate}) = \frac{5x10^{17}e^{-\sigma L}}{5+|\tau|L}$$

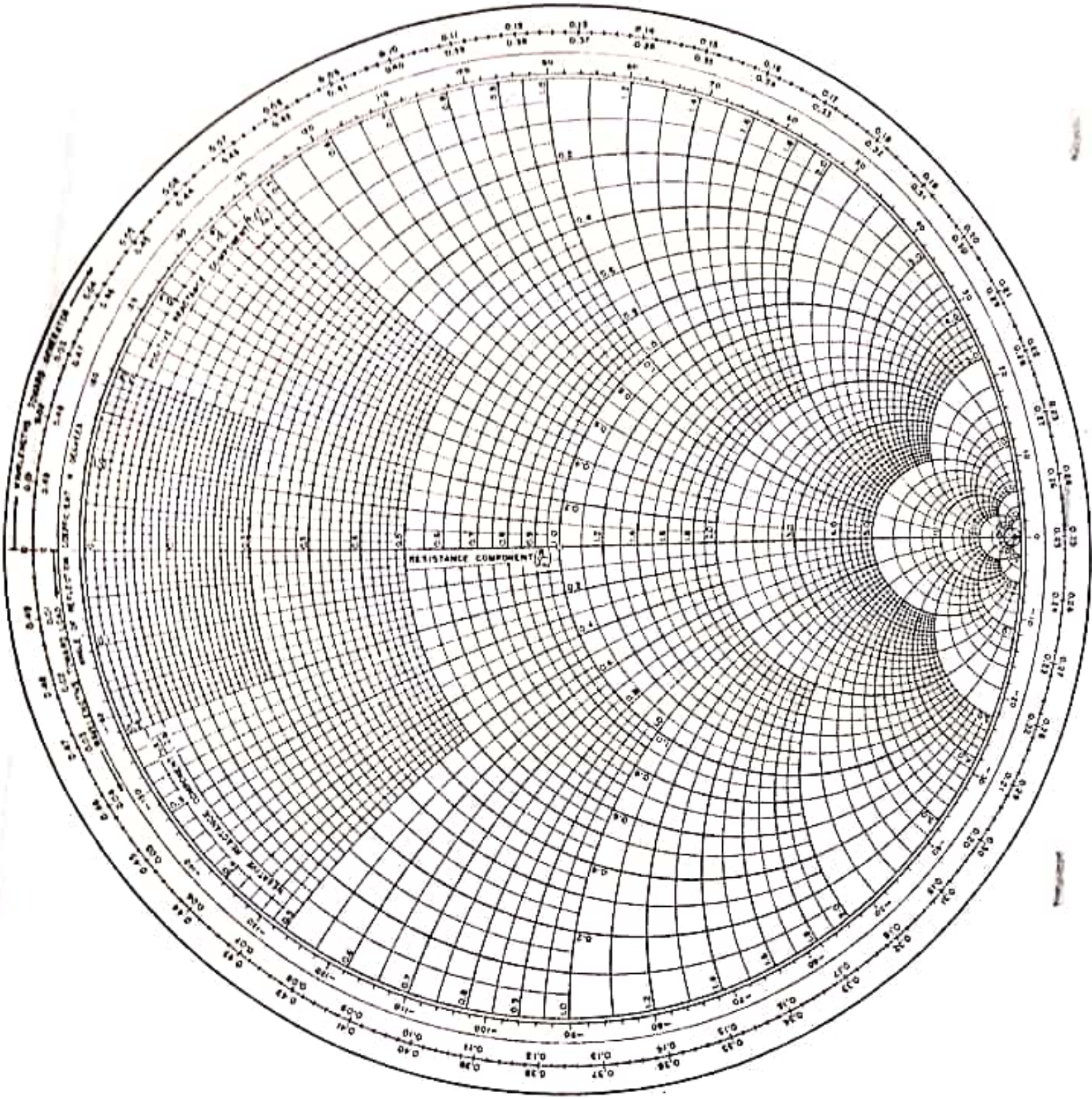
whereλ in the μm, τ in the psec/km, σ in the dB/km, B in the bit/sec. what is the best situation to work as zero chromatic dispersion or to work at minimum losses? why?

QUESTION III: (10 Mark)

1) Write short account on the EDFAs
2) Discuss the engagement of Raman and EDFAs
3) What are the advantages of the optical wireless communication
4) Draw and explain the different configuration of wireless IR links

QUESTION IV: (12 Mark)

1) Compare between LOS and non LOS for the following:
   i) Directed configuration ii) Non directed configuration iii) Hybrid configuration
2) Describe the following:
   i) Aerosol ii) scattering iii) Radiance iv) Rain v) Fog
3) Draw and explain the block diagram of an optical wireless link showing the front end of an optical transmitter and receiver.
4) Explain with drawing the direct digital modulator.



Answer the following questions;

1.(a) A microwave transistor has the following S parameters:

$S_{11} = 0.8\angle -90^{\circ}, S_{21} = 5.1\angle 80^{\circ}, \ S_{12} = 0.3\angle 70^{\circ}, S_{22} = 0.62\angle -40^{\circ}$.

Determine the stability of this transistor by using the $K-\Delta$ test. The center and the radius of the output stability circle are given by $C_L = 0.66\angle -70^{\circ}, \ R_L = 0.79$. Plot the output stability circle on the Smith chart and show the stable region.

(b) The S parameters of a microwave transistor are given by:

$S_{11} = 0.75\angle -120^{\circ}, \ S_{21} = 2.5\angle 80^{\circ}, \ S_{12} = 0.0$, $S_{22} = 0.6\angle -70^{\circ}$

Design the input matching circuit for maximum gain. Use open-circuited shunt stub (take the lower intersecting point on the unity circle of the Smith chart). Find the maximum unilateral transducer power gain ($G_{TU_{max}}$).

(a) A one-port oscillator uses a negative-resistance diode having $\Gamma_{in} = 1.25\angle 40^{\circ}$ $(Z_0 = 50\Omega)$ at its desired operating point, for $f = 6$ GHz. Design a load matching network for a 50Ω load impedance.

(b) Derive an expression for the noise figure of a mixer if the input is a double sideband signal.

Answer the Following:

1. *Draw the block diagram of GSM transmitter and explain each stage in detail?*

   (10 degrees)

2. *Why D2D Communication was suggested in 5G systems?*

   (10 degrees)

3. *What is the problem of PAPR in OFDM system and how can reduce it?*

   (10 degrees)

4. *From your opinion, what are the construction of primary system and secondary system in CRN?* *(10 degrees)*

5. *Explain Multiple Access Techniques briefly?*

   (10 degrees)

6. *Explain in detail the physical architecture of CRN?*

   (10 degrees)

7. *Prove the equation that determines the required (CIR) that sets a limit to available number of channels per cell?* *(10 degrees)*

Best Regards
Assoc. Prof. Mona Shokair

(iii)Calculate the bandwidth B in the case of the raised cosine filter with α =0.5 and the symbol rate = 40 k-symbol/sec. (14 degree)

4) A satellite transmits with an EIRP of 46dBW,calculate the received carrier-to-noise ratio if the bandwidth 35 MHz and the receiver has a G/T of 50 dB/K, assume the distance between the satellite and the earth is 35,786 km and frequency of 4 GHz. (14 degree)

$$k = \text{Boltzmann's constant} = 1.38 \times 10^{-23}\ \text{W/(Hz-K)}.$$

5-a) Draw the block diagram of the GSM mobile satellite system with the terrestrial switched networks .

5-b)What is the differences between the packet switching , circuit switching ,and virtual circuit switching using the block diagrams.

5-c) In GPS system using 4 satellites ,write the necessary equations to determine the object range , and the azimuth and the elevation angles.

..... (14 degree)

6) The generator matrix G for the Hamming block code is given by:

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$

I) Write the parity check matrix.

ii) If the data is given as 1101, find the corresponding code word.

iii) Determine the related syndrome (S) , and the logic circuit of the syndrome. (14degree)

Answer The Following Questions

1-a) Derive the circular orbital time of the satellite around the earth and the velocity of the satellite using the acceleration of gravity (g) and the radius of the earth R_e .

1-b) Compute the radius and the satellite velocity where the period time of the satellite rotation around the earth is 12 hr .

(g = 9.8087 m/sec^2, R_e =6,378 km) (15 degree)

2-a) Draw the block diagram of an example of the redundancy of the basic transponder arrangement of the satellite.

2-b) A two - array arrangement of solar cells connecting in series and parallel forming the power system of the satellite, the first tests indicate for the two array each with 1000 cells has failure rates as:

5 short- circuits failure in 10^8 hours.

Calculate the probability that two solar cells go short circuit during one year. (14 degree)

3-a) Draw the block diagram of the 8-PSK modulator and the related space diagram and the 8-PSK truth table.

3-b) An M-array communication system transmits data at rate of 200 k-symbol/sec:

(i) Estimate the equivalent bit rate in bit/sec for M= 8 , 32
(ii)Estimate the bit rate for the case (i) when using the raised cosine filter with $\alpha = 0.25$.

QUESTION 2 (10 Marks):

Complete the following sentences.

1. It is the ..... process, which gives the ..... its special properties as an optical source.

2. The most important characteristic of .....is resonant wavelengths are reflected back toward the source and non-resonant wavelengths are ..... through the device without loss.

3. An optical ..... is a nonreciprocal multiport passive device that directs light sequentially from port to port in .....

4. Applying the ..... voltage to the two arms of MZM produces optical ..... modulation to the cross port output optical signal.

5. ..... differs in their design from that of .....mainly in one respect: an additional layer is added in which secondary electron-hole pairs are generated through impact ionization.

■ ANSWER THE FOLLOWING QUESTIONS:

🕮 QUESTION 1 (10 Marks):

Determine whether the following statements are true or false. Write down your reasons.

1. One coaxial cable has a capacity that is more than 50,000 optical fibers.
   Reason:

2. One Advantage of LED over laser is simpler fabrication.
   Reason:

3. The active medium in Raman amplifier consists of a nominally 10- to 30-m length of optical fiber that has been lightly doped with a rare-earth element, such as erbium (Er).
   Reason:

4. In the case of BPSK, information is encoded in the phase difference between two neighboring bits.
   Reason:

5. By adjusting the parameters of directional coupler so that the coupled output power equal to the input power, one creates a 3-dB coupler.
   Reason:

b) Radiated by the antenna
c) Dissipated by the antenna
d) The antenna efficiency

[20 Marks]

4) For a $\lambda/2$ dipole the far field electric field intensity is given by

$$E_\theta = j\eta \frac{I_0 e^{-jkr}}{2\pi r}\left[\frac{\cos\left(\frac{\pi}{2}\cos\theta\right)}{\sin\theta}\right]$$

Write down the expression for the corresponding magnetic field, and then find the expression for the power density in the far field. Use the expressions you obtained to get the total power radiated from a half-wave dipole. Use a numerical integration technique to find the final expression for the total power radiated.
Determine the radiation resistance for a half-wave dipole from the results you have obtained.

[20 Marks]

5) A square loop antenna has a side length of 15 cm. It is made of copper wire AWG-12 of diameter 2.053 mm. It operates at a frequency of 60 MHz. It is fed by a voltage of 3 Volts.
1- Determine the input impedance of this antenna.
2- Determine the total power radiated from this loop.

[20 Marks]

6) A two element array of two isotropic sources with a separation distance equal d and a phase difference α degrees, is used for transmission. Write down an expression and sketch the radiation pattern for each of the following cases:
a) $d = \lambda/2$, $\alpha = 0°$
b) $d = \lambda/2$, $\alpha = 180°$
c) $d = \lambda/4$, $\alpha = 0°$
d) $d = \lambda/4$, $\alpha = 90°$
e) $d = \lambda$, $\alpha = 0°$

[20 Marks]

(Good Luck)

Answer the following questions:

1- a) Explain, by physical reasoning, why for an antenna, that is formed of a straight piece of wire of any finite length coincident with the Z-axis, have, due to the current flowing in its wire, some of the field components of zero magnitude, and some other components of a value. Indicate clearly the components of zero value and the components that have a value.

b) Can you use a small piece of a twin-wire transmission line without any modifications as an antenna? Justify your answer by reasoning.

c) A dipole of length 50 cm and a diameter of 1 mm, is working at 75 Meg Hz. It is fed by a current of 0.25 amps. Determine the values of the six field components at a point 20 meters away from this dipole on a line perpendicular to the dipole wire from its center. Also, determine the total power radiated from this dipole.

[25 Marks]

2- a) Prove that the impedance of the monopole is half that of the dipole of double the monopole length.

b) What are the types of the antennas? Draw a diagram to illustrate each type (only one antenna representing each type).

c) The radial component of the radiated power density of an antenna is given by

$$\mathbf{W}_{rad} = \hat{a}_r W_r = \hat{a}_r A_0 \sin\theta / r^2 \qquad (\mathrm{W/m^2})$$

Where A_0 is the peak value of power density, θ is the usual spherical coordinate, and $\hat{a}_r$ is the radial unit vector. Determine the total radiated power.

[20 Marks]

3- a) Write down an expression of the electric field intensity as a function of the potentials A and φ. Explain which is prevailing in the near field, and which is prevailing in the far field. Give your reasons in each case.

b) A $\lambda/2$ dipole, with a total loss resistance of 1 Ω, is connected to a generator whose internal resistance is 50 + *j* 25 Ω. Assuming that the peak voltage of the generator is 2 V and the impedance of the dipole is 73 + *j* 42.5 Ω, find the power

a) Supplied by the source (real)

23) The main goal of the _____is to reduce energy waste caused by idle listening, collisions, overhearing and control overhead (S-MAC protocol/IEEE802.15.4 standard).

24) The S-MAC protocol includes following major components
a: periodic listen and sleep
b: collision avoidance
c: overheating avoidance
d: message passing
Ans: _____ (a/b/c/d/all).

25) In the S-MAC protocol, _____is designed to reduce energy consumption during the long idle time when no sensing events happen, by turning off the radio periodically (message passing/periodic listen and sleep).

26) _____in S-MAC is similar to the DCF for IEEE802.11 ad-hoc mode using an RTS/CTS exchange (overhearing avoidance/collision avoidance).

27) _____defines both the physical and MAC layer protocols for most remote monitoring and control as well as sensor network applications (S-MAC protocol/IEEE802.15.4 standard).

28) _____is an industry consortium with the goal of promoting the IEEE802.15.4 standard (Bluetooth/ZigBee).

29) HVAC stands for _____.

30) RFID stands for _____.

Good luck

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10) The following are advantages of sensor network
a: energy advantage
b: detection advantage
Ans: _____ (a/b/both).

11) Dense networks of distributed communicating sensors can improve SNR by reducing average distances from sensor to source of signal or target (true/false)_____

12) A_____ sensing system is inherently more robust against individual sensor node or link failures, because of redundancy in the network (centralized/decentralized).

13) Because of the unique attenuation characteristics of RF signals, _____network provides a significant energy saving over _____network for the same distance (single hop/multi hop).

14) Using more nodes increases
a: the cost
b: the power consumption of components
Ans: _____ (a/b/both).

15) Once a signal source is inside the sensing range of a sensor, further increasing the sensor density _____the average distance from a sensor to the signal source, hence improving the SNR (decreases/increases).

16) As the number of nodes_____, every node spends almost all of its time forwarding packets of other nodes (decreases/increases).

17) The position estimation may be accomplished by
a: triangulation computation
b: least square computation
Ans: _____ (a/b/either).

18) The_____ algorithm is inefficient in utilizing the communication resources (centralized/distributed).

19) From the processing point of view, the complexity of the_____ algorithm scales linearly with K, and hence is prohibitive for large networks (centralized/distributed).

20) Radio communication is the most expensive operation a node performs in terms of energy usage, and thus it must be used sparingly and only as dictated by the task requirements (true/false)_____

21) Sensor networks are typically deployed in an ad-hoc manner (true/false)_____

22) Within the coverage range, communication is by_____ (multicast/broadcast).

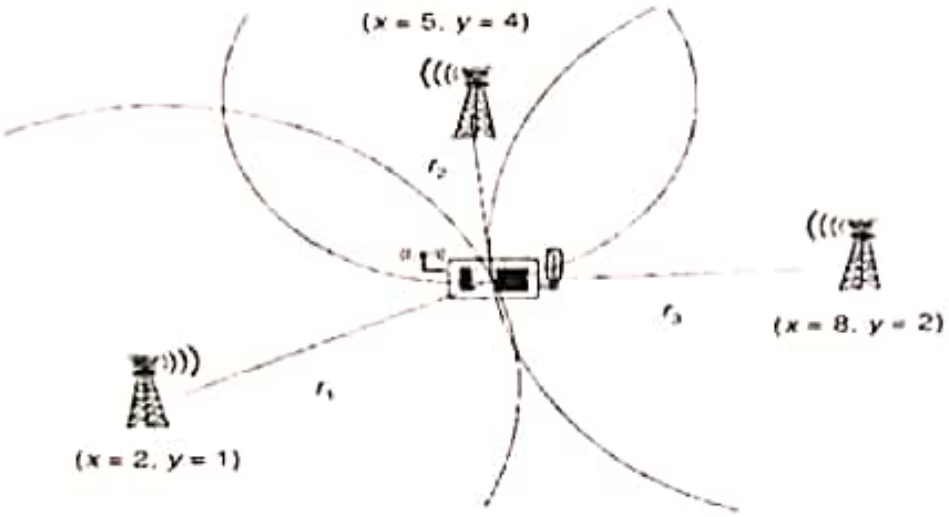

Fig. 1: Three anchors and correct distance values

Question No 5 : **(30 Marks)**

Complete the following sentences:

1) A sensor network is subject to a unique set of resource constraints such as
   a: finite on-board battery power
   b: limited network communication bandwidth
   Ans: _____ (a/b/both)
2) Communicating 1 bit over the wireless medium at short ranges consumes _____energy than processing that bit (less/more).
3) It is more appropriate to address nodes in a sensor network by_____ than by_____ (IP address/physical properties).
4) Mobility and instability in wireless links prevent the use of many existing edge network gateway protocols for internetworking IP and sensor networks (true/false)_____
5) The challenges we face in designing sensor network systems and applications include
   a: limited hardware
   b: limited support for networking
   c: limited support for software development
   Ans: _____ (a/b/c/all)
6) The greatest advantage of networked sensing is in improved_____ (robustness/scalability/both).
7) PAMAS stands for _____.
8) TRAMA stands for _____.
9) STEM stands for _____.

University	:	Menoufia		Date	: 04/01/2016
Faculty	:	Electronic Engineering		Time	: 3 Hours
Department	:	Electronics and Comm. Eng.		No. of pages	: 1
Academic level	:	4th Year		Full Mark	: 70 Marks
Course Name	:	Elective Course (Wireless Sensor Network)		Exam	: Final Exam
Course Code	:	ECE 416		Examiner	: Dr. Mohamed Rihan

Answer all the following questions :

Question No 1 : **(10 Marks)**

a) On the basis of the sensing and actuation facilities of the node, as well as the computation and communication capabilities, many different kinds of applications can be constructed. Explain the most popular applications for wireless sensor networks. (5 Marks)

b) What are the main differences between **wireless sensor networks** (WSN) and **mobile ad-hoc networks** (MANET)? (5 Marks)

Question No 2: **(10 Marks)**

a) Explain briefly the following propagation phenomena:
1) Reflection 2) Diffraction 3) Scattering, 4) Doppler fading. (5 Marks)

b) What are the most important characteristics that can be taken in to account when choosing the appropriate transceiver for sensor network application? (5 Marks)

Question No 3 : **(10 Marks)**

a) What are the most popular energy problems and design goals that affect the operation of the MAC protocol? (5 Marks)

b) Explain with the help of the schematic diagram the operation of the well-known MAC protocol called CSMA (Carrier Sense Multiple Access)? (5 Marks)

Question No 4 : **(10 Marks)**

a) Consider the wireless sensor network shown in Fig. 1. Given the positions of the anchor nodes as in the figure and distance between the anchor nodes and the node of unknown position as $r_1 = \sqrt{10}, r_2 = 2, r_3 = 3$. Evaluate the position of the unknown node. (5 Marks)

b) Explain the basic operation of the LEACH ((Low-energy Adaptive Clustering Hierarchy) protocol? (5 Marks)

Question # 1 (a. 4 points, b. 4 points , c. 4 points, d. 4 points, e. 2 points)

a. What are the types of frames in the HDLC protocol ? Explain the fields in each and Show how to distinguish the frames from each other?
b. Explain the data link channel states in the data link protocol HDLC.
c. A primary station has just come back on-line announces its presence, The secondary station confirms the acceptance of the primary, and transmits a single response frame. Show
   c1. The type of the primary and secondary frames.
   c2. Show the contents of the control field in each frame.
d. What are the reasons for a secondary station to consider a frame to be **non-valid**. What action is taken by the secondary if it receives a non-valid frame ?
e. The following HDLC frame is received at the receiver
   01111110 000001 010111 1101000000111110000111101 1010101010101111110 01111110
   Write The contents of the frame before transmission .

Q88: The orbits of GPS satellites are ..... Km above the earth.
a) 24000 b) 22000 c) 20000

Q89: GPS orbit period ..... hours.
a) ≈ 8 b) ≈ 10 c) ≈ 12

Q90: In mobile trainer, matching circuit is used to ..... .
a) match impedance for effective power transmission between end power amplification part and antenna
b) match impedance for effective power transmission between antenna and initial amplifier.
c) a & b

Q91: In fiber optics systems, losses from splices and connections can ..... losses in the cable itself.
a) be less than b) be more than c) equal to

Q92: In mobile trainer, particularly in half-duplex experiment, the training system has ..... transmitting and receiving frequencies respectively.
a) 10 b) 15 c) 20

Q93: In mobile trainer, exciter amplifier amplifies .....
a) the power to the level required to radiate the modulated wave to the far location
b) necessary power
c) a & b

Q94: In mobile trainer, Buffer amplifier loosely couples the oscillation part and amplification part so that the oscillation part is ..... by the amplifier.
a) much more affected b) less affected c) unaffected

Q95: In mobile trainer, the PLL part in the receiving part is used to ..... .
a) detect the signal from the demodulated wave
b) generate the local oscillation frequency
c) a & b

Q96: In mobile trainer, Exciter amplifier is used to amplify the ..... wave to proper multiple times.
a) demodulated b) modulated c) transmitted

Q97: Commonly used range of electromagnetic spectrum in fiber optics is .....
a) 200nm-1650nm b) 200nm-1650mm c) 300nm-1650mm

Q98: Condenser mikes are classified into ..... .
a) condenser and electric condenser types
b) coil and ribbon types
c) ribbon and condenser types

Q99: Point-to-point protocol is used with .....
a) GPRS b) GSM c) a & b

Q100: In optical fiber, the dispersion is ..... as the length of the optical fiber decreased.
a) decreased b) increased c) unchanged

With my best wishes
Dr. Osama Zahran

Q69: The de-emphasis circuit has the same features as ..... circuit.
a) low pass filter b) high pass filter c) band pass filter
Q70: In single-mode fiber, dispersion occurs because the index of the glass varies slightly depending on the wavelength of the light.
a) True b) False c) I do not know
Q71: GPS receiver determines the altitude through receiving at least signals from.....GPS satellites.
a) 3 b) 4 c) 5
Q72: In FM modulation, the more noise output ....., the higher the frequency is.
a) decreases b) increases c) equal to
Q73: Using multi-mode fibers ..... the bandwidth of the link.
a) increases b) limits c) I do not know
Q74: Using L.E.Ds in fiber optics causes ..... .
a) slower switching b) faster switching c) shorter lifetime
Q75: The pre-emphasis circuit weakens the ..... frequency part component of the transmitted signal which had been emphasized by pre-emphasis circuit in transmitting part.
a) low b) high c) low and high
Q76: Losses in multimode fiber is ..... losses in single-mode fiber.
a) lower than b) greater than c) equal to
Q77: According to the synthesis features of de-emphasis process, we can see that as the frequency becomes higher, the output voltage value .....
a) increases b) decreases c) unchanged
Q78: GPS receiver accuracy is minimized to ..... mm.
a) less than 1 b) less than 10 c) less than 100
Q79: The transmitted signals of GSM systems are .....
a) analogue b) digital c) a & b
Q80: In fiber optics systems, guided ray has an incident angle ..... the critical angle.
a) equal to b) greater than c) less than
Q81: In graded index fibers, refractive index of the core is ..... .
a) increasing gradually from the center of the core
b) decreasing sharply from the center of the core
c) decreasing gradually from the center of the core
Q82: In mobile trainer, the expander restores the received signal to its original form by .....
a) enhancing the signal with big amplitude more
b) weakening the weak input signal
c) a & b
Q83: A reverse bias voltage of P-I-N diodes is ..... volts.
a) 5 b) 10 c) 5-10
Q84: In mobile trainer, squelch circuit is used to automatically cuts the power of speaker circuit when ..... .
a) the level of receiving signal is very weak
b) there is no signal received at the receiver
c) a & b
Q85: GSM was developed as ..... for a mobile telephone syste.
a) international standard b) European standard c) a & b
Q86: In mobile trainer, the frequency of carrier wave is determined by..... .
a) carrier wave oscillation part b) channel data part c) channel data
Q87: In mobile trainer, the resonance circuit is used to ..... .
a) reduces remaining element of frequency, thus acting like a band pass filter
b) aligns the desirable element of frequency to LC resonance circuit
c) a & b

Q48: In mobile trainer, limiter circuit is installed to ..... .
a) avoid exceeding the maximum frequency shift the standard level.
b) avoid output saturation
c) a & b

Q49: GPS satellites are distributed in ..... orbits.
a) 10 b) 8 c) 6

Q50: In mobile trainer, compressor automatically.....output value depending on input signal amplitude level.
a) increases b) decreases c) increases/decreases

Q51: GSM frequency bands that used in Europe is ..... that used in Asia.
a) the same as b) similar to c) differing from

Q52: Optical power that lunched into fiber when using L.E.D are in order of ..... μ Watts.
a) 25 b) 30 c) 35

Q53: The maximum throughput of the ALOHA strategy is about ..... .
a) 18.3% b) 13.8% c) 38.1%

Q54: Avalanche diodes have ..... P-I-N devices.
a) higher sensitivity than b) lower sensitivity than c) similar sensitivity to

Q55: The GPS system consists of ..... GPS satellites.
a) 24 b) more than 24 c) less than 24

Q56: In voice signal, the high frequency component has.....signal level than audio frequency component.
a) lower b) higher c) equal

Q57: Any point on the earth is seen by ..... GPS satellites.
a) 3 b) 3 or less c) 3 or more

Q58: The maximum throughput of the ALOHA strategy occurs when the rate at which packets arrive is ..... the capacity of the bus.
a) less than b) greater than c) equal to

Q59: Losses in optical fiber are mainly resulting from ..... .
a) attenuation b) scattering c) a & b

Q60: Carrier Sense Multiple Access is used to ..... .
a) detect the presence of a transmission on the network
b) avoid a collision with the transmission of nodes
c) a & b

Q61: The moving speed of GPS satellites is ..... the rotation speed of the earth.
a) equal b) less than c) greater than

Q62: Photo-transistors convert light into ..... .
a) current b) voltage c) a or b

Q63: GPS satellites signals are travelling with ..... .
a) speed < speed of light b) speed >speed of light c) speed of light

Q64: P-I-N diode acts as a variable resistor with range .....
a) 0.1Ω to 10KΩ b) 1Ω to 10KΩ c) 0.1Ω to 10Ω

Q65: In ALOHA, as the vulnerable period increases, the probability of a collision for each packet .....
a) increases b) decreases c) unchanged

Q66: As with ALOHA, the theoretical analysis assumes symmetric distribution of packet arrivals. In an asymmetric case, the throughput could be ..... .
a) higher b) lower c) the same

Q67: Pre-emphasis circuit is the circuit that amplifies the high frequency signal before .....
a) modulation b) amplification c) transmission

Q68: GPS satellites send ..... to GPS receivers.
a) its location and time b) its location information c) a & b

Dynamic mikes are classified into ..... .
a) condenser and electric condenser types
b) coil and ribbon types
c) coil and electric condenser types

Q34: At the highest layer of the computer network, there is the protocols .....
a) ensure that define the electrical characteristics of the link, the representation of bits, and the mechanical details of connectors and cable
b) for actually transferring the complete file
c) that handle sending and reception of packets

Q35: A directional coupler permits ..... waves on a line to be coupled out in accordance with their direction of travel. simplicity.
a) forward b) reverses c) a & b

Q36: Depending on the power generation device, mikes currently available commercially can be ..... .
a) dynamic type b) condenser type c) a & b.

Q37: Butterworth filter is optimized to achieve ..... .
a) low phase distortion in the pass-band
b) maximum flatness in the pass-band
c) clear separation between the pass-band and stop-band

Q38: The core of multi-mode fibers is ..... μm.
a) greater than 10 b) less than 10 c) up to 20

Q39: In ALOHA, the destination address is placed ..... the source address.
a) after b) before c) in line with

Q40: The medium access control (MAC) sub-layer of the Data Link Layer (DDL) improves the transmission of a stream of bytes across a link through .....
a) dividing the byte-stream into packets
b) adding error detection
c) a & b

Q41: Bessel filter is optimized to achieve ..... .
a) maximum flatness in the pass-band
b) low phase distortion in the pass-band
c) clear separation between the pass-band and stop-band

Q42: Each GSM frequency band is used for ..... .
a) uplink and downlink b) Uplink or downlink c) a & b

Q43: The process of restoring the compressed signal to its original state using reverse-compression at the mobile trainer receiver end is called ..... .
a) companding b) expansion c) interpolation

Q44: Tschebyscheff filter is optimized to achieve ..... .
a) maximum flatness in the pass-band
b) low phase distortion in the pass-band
c) clear separation between the pass-band and stop-band

Q45: The driver in fiber optics system converts the original electrical signal into a format suitable for transmission over the system.
a) True b) False c) I do not know

Q46: In blocking packet transmission, ...
a) the sender cannot respond to any other events while a data packet is being transmitted.
b) the sender can respond to any other events while a data packet is being transmitted.
c) the sender can respond to any other events while a data packet is being received.

Q47: In general, audio systems use compression amplification circuit to ..... .
a) enhance received signal b) enhance transmitted signal c) enhance SNR

Q18: At the middle layer of the computer network, we have protocols .....
a) ensure that define the electrical characteristics of the link, the representation of bi and the mechanical details of connectors and cable
b) that handle sending and reception of packets
c) for actually transferring the complete file

Q19: A Wilkinson divider permits ..... .
a) reflection-free division of power and decoupled merging of signals
b) distribution of a power input at port 1 among ports 2 and 3
c) a & b

Q20: The ..... is the most popular topology for local area networks because of its simplicity and reliability.
a) the ring topology b) bus topology c) star topology

Q21: The ripple factor is defined as .....
a) the percentage of the direct current element of the waveform to the effective value of the alternating current element.
b) the percentage of the effective value of the alternating current element to the direct current element of the waveform.
c) the percentage of the alternative current element of the waveform to the effective value of the direct current element.

Q22: In wide area networks usually ..... used.
a) incomplete mesh topology is b) star topology is c) a & b are

Q23: The Baud rate of GPRS is ..... Kbps.
a) 171.2 b) 172.1 c) 17.12

Q24: A suspended stripline is considered as a special case of ..... microstrip line.
a) asymmetric b) symmetric c) coplanar

Q25: In the physical layer of the computer network, we have protocols .....
a) ensure that define the electrical characteristics of the link, the representation of bits, and the mechanical details of connectors and cable
b) that handle sending and reception of packets
c) for actually transferring the complete file

Q26: The signals at both outputs of Wilkinson divider ..... .
a) have synchronous phases b) are 180° out of phase c) are 90 ° out of phase

Q27: Phototransistors have significantly ..... .
a) Long response time b) high frequency response c) a & b

Q28: Avalanche diodes are designed for ..... .
a) working in forward bias
b) working in reverse bias
c) breakdown at a specified reverse bias voltage

Q29: To avoid over-charging of the battery that used in the mobile station, ...
a) a comparator is used to stop charging at the required voltage
b) the charging control circuit controls the flow of the charging current by setting the output of the constant voltage conversion part to a standard voltage
c) a & b.

Q30: The mobile generation of GSM with GPRS is .....G.
a) 3.5 b) 3 c) 2.5

Q31: Attenuation in fiber optics is caused by ..... .
a) material absorption and microscopic fluctuations in density
b) connection losses and physical stresses to the fiber
c) a & b

Q32: GSM is the abbreviation of ..... .
a) Group Special Mobile b) Global System for Mobile c) a & b

Choose the correct answers: (0.5 Mark for each Question)

Q1: If the basic configurations of the base station and the mobile station are the same, the transmitting/receiving frequencies are ..... .
a) the same b) different c) similar

Q2: In mobile trainer, modulation part modulates audio or data signal received from the radio frequency part and propagates ..... modulated waves through the antenna.
a) AM b) FM c) PSM

Q3: The mobile generation of GSM is .....G.
a) 3 b) 2.5 c) 2

Q4: GSM has ..... frequency bands.
a) 3 b) 4 c) 5

Q5: In the ring topology, a transceiver is used to ..... .
a) ensure that every node receives a circulated packet
b) avoid the packet circulating indefinitely
c) a & b

Q6: Microstrip lines are employed in circuits operating at frequencies ranging from .....
a) a few hundred hertz to about 20 KHz
b) a few hundred kilohertz to about 20 MHz
c) a few hundred megahertz to about 20 GHz

Q7: Transmission speed of GSM is ..... Kbps.
a) 9.6 b) 6.9 c) 171.2

Q8: ..... microstrip line is the most commonly found type of microstrip for its geometric simplicity.
a) An asymmetric b) A symmetric c) A suspended

Q9: The angle of acceptance is ..... the numerical aperture.
a) twice b) half c) equal to

Q10: The Baud rate of GSM is ..... for multimedia transmission.
a) insufficient b) sufficient c) used

Q11: A disadvantage of using L.E.D in fiber optics is its voltage sensitivity.
a) True b) False c) I do not know

Q12: Laser diodes give power up to ..... W.
a) 10 b) 1000 c) 10000

Q13: Single point of failure in network connection can be avoided by using .....
a) the ring topology b) the bus topology c) a & b

Q14: Many high-frequency circuits based on microstrip technology can be operated without the need for hermetic housings or isolated chambers because microstrip lines ..... .
a) have low field propagation outside the planar structure
b) minimize the release of radiation to the surroundings
c) a & b

Q15: Bandwidth-distance product is commercially expressed in units of .... .
a) KHz.m b) MHz.m c) MHz.Km

Q16: For battery used in mobile station, battery charging current differs depending on ..... .
a) the number of connection between the POWER board and other boards.
b) the current voltage of the battery.
c) a & b.

Q17: The output waveforms of the regulation circuit in mobile trainer usually have ripples, the ..... the ripple factor, the clearer direct current output can be obtained.
a) greater b) smaller c) same

Answer the following questions:

1- A weather forecasting satellite sends the following analog signal with 4 kHz bandwidth sampled at 1.3 Nyquist rate to an earth station. The message contains the following probabilities; P (clouds) = 0.25, P (rain) = 0.30, P (snow) = 0.10, P (wind) = 0.20, P (fog) = 0.10, P (sun) = 0.05. Obtain;

a- The information source capacity,

b- A code for this report, and calculate its variance. **[15]**

2-a- Car license plates, each contains 3 letters, and 4 numbers. Calculate the amount of information contained in 8 license plates,

b- Compare between;

i- H (X,Y) = H (X) + H (Y), H (X,Y) < H (X) + H (Y), and H (X,Y) = H (X) = H (Y),

ii- The symmetric channel, and the channel with independent input and output.

c- State the situation when I(X, Y) = H(X) = H(Y). **[18]**

3- a-Compare between the following two discrete channels;

1-The first channel has input message such as; "11111111111111100000" while the received message was "11111111000011100011".

2-The second channel has the following matrix;

$$\begin{vmatrix} 0.04 & \ldots\ldots & 0.06 \\ \ldots\ldots & 0.03 & 0.09 \\ 0.14 & 0.12 & \ldots\ldots \\ \ldots\ldots & 0.08 & 0.13 \end{vmatrix}$$

with source probabilities; [0.17, 0.18, ……, 0.25]

b- Find the following;

i- Max. amount of information at the first channel output,

ii- The transition matrix of the opposite type of each channel,

iii- The amount of received information in a message of 40 symbol from the second channel when all received information are correct. **[22]**

4- A transmission channel with 4 M Hz BW carried traffic load information. The transmitted signal level was higher than the accompanied noise level by 30 dB. Calculate the channel capacity, and the amount of information transmitted during 6 minutes, if the time between messages has the density function;

$$P(t) = \begin{pmatrix} 0.42 \exp(-0.42t) & t > 0 \\ 0 & elsewhere \end{pmatrix}$$

Show the effect of changing the channel BW from 4 MHz to 12 MHz, with the same channel capacity. **[10]**

Question # 3 (8 points)

3.a. Give and explain the modes of operation of the HDLC protocol.

ANSWER

3.b. In an HDLC I-frame the following Information is to be transmitted,
"100111000111111001111100"
Show how it can be transmitted without error in the frame,
ANSWER Write the answer under the actual data

Question # 1 (10 points) Write the answer beside each question

Write the name and the number of the OSI layer that is concerned with the following:

ANSWER

1.1. Message compression and encryption
1.2. Addressing and routing within a subnet
1.3. Transmission rate
1.4. Transfer files between two computers
1.5. Allowing a user to log into the system
1.6. Function of pins in a connector
1.7. Break the input data into frames
1.8. System activities
1.9. Error free transmission of data units
1.10. Peripheral device coding and formatting

Q1-B) – MCQ (one point each)

1. Windowing is provided at what layer of the OSI reference model?
a. Data link layer
b. Network layer
c. Transport layer
d. Physical layer

2. What is the first DHCP message sent by a client attempting to obtain IP address information from a DHCP server?
a. DHCPOFFER
b. DHCPACK
c. DHCPDISCOVER
d. DHCPREQUEST

3. Which of the following statements are true regarding VLANs? (Choose two.)
a. A VLAN has a single broadcast domain.
b. For traffic to pass between two VLANs, that traffic must be routed.
c. Because of a switch's MAC address table, traffic does not need to be routed to pass between two VLAN
d. A VLAN has a single collision domain.

4. A client with an IP address of 172.16.18.5/18 belongs to what network?
a. 172.16.0.0/18
b. 172.16.4.0/18
c. 172.16.8.0/18
d. 172.16.16.0/18

5. What type of RJ45 UTP cable is used between switches?
A. Straight-through
B. Crossover cable
C. Crossover with a CSU/DSU
D. Crossover with a router in between the two switches

Best of Luck

Dr/ Mahasen Omar

Attempt the following questions:

Q1-a) What is meant by:

1- Connectionless protocol? (2 Points)

2- Masking? (1 Point)

3- Direct delivery? (1 Point)

4- Proxy server? (2 Points)

5- DNS? (2 Points)

6- Broadcast Domain? (2 Points)

Answer TWO Questions Only

Question 1: (10 Marks)

1-a Explain the functions of Psycho-acoustic Model

1-b Draw and explain block diagram of a DRC system for DAB

Question 2: (10 Marks)

2-a Mention the parameters for DAB Coverage Evaluation

2-b Draw and explain block diagram of a DAB transmitter with DIQ baseband input

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Question 3: (10 Marks)

Draw DAB digital audio broadcasting receiver block schematic, explain briefly the function of each block

♦ Subject: Mid term Exam
♦ قسم هندسة الإلكترونيات والاتصالات الكهربية
♦ تاريخ الامتحان : ١٢ / ٤ / ٢٠١٦ م

جامعة المنوفية

♦ المادة: اقتصاد هندسي وتشريعات
♦ الفرقة : الرابعة-اتصالات
♦ زمن الامتحان: ساعة واحدة

اجب عن الأسئلة التالية:

السؤال الأول:

أ) قام مدير مراقبة الإنتاج بسحب عينة من ١٠ عبوات من المياه المعبأة للشرب ذات الحجم ٥ لتر وكانت البيانات موضحة طبقا للجدول التالي:

١١٥	١٢٣	١١٩	١٢٣	١٢٤	١١٩	١٢٣	١٢١	١٢٣	١٢١

والمطلوب حساب المتوسط الحسابي، الوسيط، والمنوال ثم حدد شكل الالتواء لهذه البيانات.

ب) الجدول التالي يوضح توزيع ٤٠ تلميذ حسب أوزانهم والمطلوب إيجاد الوسط الحسابي للبيانات التكرارية.

فئات الوزن	٣٢-٣٤	٣٤-٣٦	٣٦-٣٨	٣٩-٤٠	٤٠-٤٢	٤٢-٤٤
عدد التلاميذ	٤	٧	١٣	١٠	٥	١

ج) فيما يلي كمية الإنتاج اليومي من الحليب باللتر للبقرة الواحدة لعينة حجمها ١٠ أبقار اختيرت من مزرعة معينة وكانت بياناتها طبقا للجدول التالي والمطلوب احسب الرباعيات الثلاث لكمية الإنتاج وما هو تعليقك علي النتائج

٢٥	٢٣	٢٩	٣٢	٣٤	٢٩	٢٠	١٨	٢٧	٣٠

السؤال الثاني:

أ) فيما يلي دراسة علاقة الاستهلاك المحلي (ص) بالإنتاج (س) بالمليون برميل خلال عدة سنوات وأخذت قراءات تقريبية كما هو موضح بالجدول التالي:

س	١٠	١٣	١٥	١٤	٩	٧	٦	٦	٥	٥
ص	٦	٨	٩	٨	٧	٦	٥	٦	٥	٥

أوجد معادلة الخط المستقيم وتوقع قيمة الاستهلاك عندما يصل الإنتاج إلي ١٦ مليون برميل

ب) من بيانات الجدول التالي احسب معامل الارتباط بين الرتب لسبيرمان لقيم س، ص محددا نوعه ودرجته

س	جيد	جيد جدا	ممتاز	ضعيف	جيد	ممتاز	ضعيف جدا
ص	مقبول	ضعيف	جيد جدا	ممتاز	جيد	ضعيف جدا	جيد جدا

Q41: Photo-transistors convert light into ..... .
a) current b) voltage c) a or b

Q42: Using multi-mode fibers ..... the bandwidth of the link.
a) increases b) limits c) I do not know

Q43: Using L.E.Ds in fiber optics causes ..... .
a) slower switching b) faster switching c) shorter lifetime

Q44: Losses in multimode fiber is ..... losses in single-mode fiber.
a) greater than b) lower than c) equal to

Q45: In graded index fibers, refractive index of the core is ..... .
a) increasing gradually from the center of the core
b) decreasing sharply from the center of the core
c) decreasing gradually from the center of the core

Q46: A reverse bias voltage of P-I-N diodes is ..... volts.
a) 5 b) 10 c) 5-10

Q47: In multimode fiber, dispersion occurs because the index of the glass varies slightly depending on the wavelength of the light.
a) True b) False c) I do not know

Q48: Commonly used range of electromagnetic spectrum in fiber optics is ..... KW.
a) 100nm-1650nm b) 200nm-1650nm c) 300nm-1650nm

Q49: In fiber optics systems, unguided ray has an incident angle ..... the critical angle.
a) equal to b) less than c) greater than

Q50: In fiber optics systems, losses from splices and connections can ..... losses in the cable itself.
a) be more than b) be less than c) equal to

Q	a	b	c
41	O	O	O
42	O	O	O
43	O	O	O
44	O	O	O
45	O	O	O
46	O	O	O
47	O	O	O
48	O	O	O
49	O	O	O
50	O	O	O

With my best wishes

Dr. Osama Zahran

Q21: GSM was developed as ..... for a mobile telephone syste.
a) international standard b) European standard c) a & b

Q22: The transmitted signals of GSM systems are ..... .
a) digital b) analouge c) a & b

Q23: Laser diodes give power up to ..... KW.
a) 10 b) 20 c) 30

Q24: Avalanche diodes can detect X-ray and Gamma ray photons.
a) True b) False c) I do not know

Q25: The numerical aperture is ..... the angle of acceptance.
a) twice b) half c) equal to

Q26: A photodiode is designed to operate in ..... .
a) forward bias b) reverse bias c) a & b

Q27: Bandwidth-distance product is commercially expressed in units of .... .
a) KHz.m b) MHz.m c) MHz.Km

Q28: An advantage of using L.E.D in fiber optics is its voltage sensitivity.
a) True b) False c) I do not know

Q29: Multi-mode fibers have core ..... μm.
a) less than 50 b) up to 50 c) greater than 50

Q30: Avalanche diodes are designed for ..... .
a) working in forward bias b) working in reverse bias
c) breakdown at a specified reverse bias voltage

Q31: Attenuation in fiber optics is caused by ..... .
a) material absorption and microscopic fluctuations in density
b) connection losses and physical stresses to the fiber c) a & b

Q32: Guiding of light in optical fiber depends on ..... .
a) reflection only b) reflection and refraction c) a & b

Q33: Phototransistors have significantly ..... .
a) Long response time b) high frequency response c) a & b

Q34: The core of single-mode fibers is ..... μm.
a) less than 10 b) less than or equal 10 c) up to 20

Q35: In optical fiber, the dispersion is ..... as the length of the optical fiber decreased.
a) increased b) decreased c) unchanged

..... fiber when using L.E.D are in order of ..... μ Watts.

Q	a	b	c
21	O	O	O
22	O	O	O
23	O	O	O
24	O	O	O
25	O	O	O
26	O	O	O
27	O	O	O
28	O	O	O
29	O	O	O
30	O	O	O
31	O	O	O
32	O	O	O
33	O	O	O
34	O	O	O
35	O	O	O
36	O	O	O
37	O	O	O
38	O	O	O
39	O	O	O
40	O	O	O

Choose the correct answers:

Q	a	b	c
1	O	O	O
2	O	O	O
3	O	O	O
4	O	O	O
5	O	O	O
6	O	O	O
7	O	O	O
8	O	O	O
9	O	O	O
10	O	O	O
11	O	O	O
12	O	O	O
13	O	O	O
14	O	O	O
15	O	O	O
16	O	O	O
17	O	O	O
18	O	O	O
19	O	O	O
20	O	O	O

Q1: The mobile generation of GSM is .....G.
a) 2 b) 2.5 c) 3

Q2: GSM has ..... frequency bands.
a) 2 b) 3 c) 4

Q3: Transmission speed of GSM is ..... Kbps.
a) 6.9 b) 9.6 c) 171.2

Q4: The Baud rate of GSM is ..... for multimedia transmission.
a) sufficient b) insufficient c) used

Q5: The Baud rate of GPRS is ..... Kbps.
a) 171.2 b) 17.12 c) 172.1

Q6: The mobile generation of GSM with GPRS is .....G.
a) 2.5 b) 3 c) 3.5

Q7: GSM is the abbreviation of ..... .
a) Group Special Mobile b) Global System for Mobile c) a & b

Q8: Each GSM frequency band is used for ..... .
a) Uplink or downlink b) uplink and downlink c) a & b

Q9: Point-to-point protocol is used with .....
a) GSM b) GPRS c) a & b

Q10: GSM frequency bands that used in Europe is ..... that used in Asia.
a) the same as b) differing from c) similar to

Q11: GPS satellites are distributed in ..... orbits.
a) 6 b) 8 c) 12

Q12: Any point on the earth is seen by ..... GPS satellites.
a) 3 b) 3 or more c) 4 or more

Q13: The GPS system consists of ..... GPS satellites.
a) less than 24 b) more than 24 c) 24

Q14: The moving speed of GPS satellites is ..... the rotation speed of the earth.
a) equal b) greater than c) less than

Q15: GPS receiver determines the altitude through receiving signals from ... GPS satellites.
a) 3 b) 3 or more c) 5

Q16: GPS satellites send ..... to GPS receivers.
a) its distance information b) its location and time c) a & b

Q17: GPS satellites signals are travelling with ..... .
a) speed < speed of light b) speed of light c) speed >speed of sound

Q18: The orbits of GPS satellites are ..... Km above the earth.
a) 20000 b) 24000 c) 28000

Q19: GPS orbit period ..... hours.
a) ≈ 12 b) ≈ 16 c) ≈ 20

Q20: GPS receiver accuracy is minimized to ..... cm.
a) less than 1 b) less than 3 c) less than 100

Answer all the following questions :

Question No 1 : **(10 Marks)**

a) On the basis of the sensing and actuation facilities of the node, as well as the computation and communication capabilities, many different kinds of applications can be constructed. List more than **Six** applications for wireless sensor networks. (5 Marks)

b) What are the main differences between **wireless sensor networks** (WSN) and **mobile ad-hoc networks** (MANET)? (5 Marks)

Question No 2: **(10 Marks)**

a) Draw the block diagram of the wireless sensor nodes and briefly explain the function of its main components. (5 Marks)

b) What are the most important characteristics that can be taken in to account when choosing the appropriate transceiver for sensor network application? (5 Marks)

Question No 3 : **(10 Marks)**

a) Write down the equations and draw the waveform that describe the modulated signal in case of 1) ASK 2) FSK 3) PSK. (5 Marks)

b) Explain briefly the following propagation phenomena:
1) Reflection 2) Diffraction 3) Scattering, 4) Doppler fading. (5 Marks)

Good luck

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a) What is the output voltage when the SCR is off?

b) What is the input voltage that triggers the SCR?

c) If V_{CC} is decreased until the SCR opens, what is the value of V_{CC} ?

1- Put √ for true and × for false:

a) The normal way to turn on a *DIAC* is by gate current,

b) When a *UJT* is turned *ON*, the resistance between emitter terminal and lower base terminal is decreased,

c) To turn on *UJT*, the forward bias on the emitter diode should be less than the peak point voltage,

d) An *SCR* is turned off by reducing gate voltage to zero,

e) If firing angle in an *SCR* circuit is increased, the output is increased,

f) Latching current, is the minimum principal current required to maintain the *thyristor* in the on state,

g) Holding current, is the minimum principal current required to maintain the *thyristor* in the on state immediately after the switching from off state to on state has occurred and the triggering signal has been removed,

h) Intrinsic standoff ratio of a *PUT* is the ratio of the external resistor R_1 to the sum of R_1 and R_2,

i) An *SCS* can be turned *ON* by the application of a negative gate pulse at the anode gate, and in the *ON* state, it can be turned *OFF* by the application of a positive pulse at the anode gate or a negative pulse at the cathode gate,

j) The *GTO* can be turned-on by a gate signal, and can also be turned-*OFF* by a gate signal of negative polarity,

k) Breakover voltage, is the minimum forward voltage, when gate being open, at which *SCR* starts conducting heavily i.e. turned *ON*

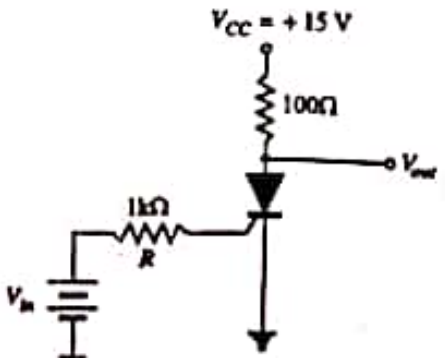
l) Circuit fusing rating, is the product of square of forward surge current and the time of duration of the surge,

m) If the specified *dv/dt* is exceeded, *thyristors* may start conducting without applying a gate pulse,

n) The *Quadrac* is basically a *diac* and *triac* fabricated together within a single package,

o) Snubbers limiting *di/dt* of currents through the semiconductor device at device turn-on.

2- The SCR of the Figure has gate trigger voltage $V_T = 0.7V$, gate trigger current $I_T = 8\ mA$ and holding current $I_H = 7\ mA$.



Answer all the following questions:

Question No 1 : **(15Marks)**

a) Identify the five components of a data communications system. Explain each of them.

b) What are the three criteria necessary for an effective and efficient network?

c) Why are standards needed?

d) Define topology and remember the possible basic topologies: Explain and give the advantages and disadvantages of star topology.

Question No 2: **(10Marks)**

a) What are the three major classes of guided media? Explain one of them.

b) Define The Bandwidth B and then Calculate the bandwidth of the ***light*** for the following wavelength ranges (assume a propagation speed of light is $C=2 \times 10^8$ m/s):
   1. 1000 to 1200 nm
   2. 1000 to 1400 nm

c) A signal travels from point A to point B. At point A, the signal power is 100 W. At point B, the power is 90 W. What is the attenuation in decibels?

d) A device is sending out data at the rate of 1000 bps. How long does it take to send out 10 bits?

Question No 3 : **(10 Marks)**

a) We have a channel with 4 KHz bandwidth. If we want to send data at 100 Kbps, what is the minimum SNR dB? What is SNR? Use Shannon formula.

b) What is the transmission time of a packet sent by a station if the length of the packet is 1 million bytes and the bandwidth of the channel is 200 Kbps?

c) Describe the need for switching and explain Packet Switch.

Question 1

A – Define the Following:

1 – Pattern recognition.
2 – Supervised classification.
3 – Loss-Function.
4 – Maximum and Log-likelihood function.

B - Draw and explain the general block diagram of the Pattern recognition system.

Part II

Answer the following questions:

Question 1: **(Answer two points only)** **(10 Marks)**

a- Explain the basic idea of color shift keying.

b- Show how pulse width and pulse position modulation are used in visual light communication systems. Give examples.

c- What are the limitations encountered in underwater acoustic communication channels? Explain the effect of these limitations on the channel model, and show how the model can be simplified.

Question 2**: (Answer two points only)** **(10 Marks)**

a- What is the difference between Fountain and network coding? Give examples for both of them and state the conditions required in Fountain coding schemes.

b- What is the basic idea of cancelable biometric systems? Explain two different methods that can be used for cancelable biometrics on faces and fingerprints.

c- Compare between the ToA, TDoA, RSS based fingerprinting, and AoA methods for indoor wireless location determination. Can we use hybrid schemes for location determination? Explain how.

Question 3**: (Answer two points only)** **(10 Marks)**

a- Illustrate the possible attack points in cancelable biometric systems. Show how to generate cancelable iris templates. What is the difference

4-a) Draw the block diagram of the QPSK modulator and the related space diagram and the QPSK truth table. (5 degree)

4-b)An earth station received a signal from satellite with a bit rate of 1 Mbit/sec , and the required E_b/N_0 equal to 10 dB using QPSK with available bandwidth of 2MHz , calculate the carrier –to- noise ratio and the channel capacity. (5 degree)

5-a) Define the pre-assigned and the demand-assigned FDMA.

(4 degree)

5-b) Derive the IS-95 system capacity M of the DS- CDMA depending on the carrier C – to the interference I ratio. (3 degree)

5-c) Calculate the capacity M (number of users) of the DS-CDMA system using the following data :

E_b/N_0 = 7 dB , system bandwidth = 2.048 MHz

Information bit rate = 16 kbps , voice activity factor (α =0.4)

Cell interference F_e = 0.6 , sector gain G =2.5. (3 degree)

6-a) Explain the main components of the mobile satellite system and the function of each component. (4 degree)

6-b) Explain the entities of store and forward connection used in inter-satellite link. (3 degree)

6-c) Draw the block diagram used to connect a mobile user with the internet using satellite system. (3 degree)

Menoufia University		Satellite Engineering Exam
Faculty of Electronic Engineering	no. of pages 2	Fourth year
Electronic &Comm. Department	2017	Time: 3 hours

Answer the Following Question

1-a) Derive the third Kepler law. (4 degree)

1-b) Compute the radius and the satellite velocity where the period time of the satellite rotation around the earth is 10 hours .

($g = 9.8087\ m/sec^2$, $R_e = 6{,}378\ km$) (6 degree)

2-a) Describe the principle of operation of the scrambler and the descrambler with the block diagram and related equations. (6 degree)

2-b)An earth station transmitter has it's rated power at 1000 W ,and it has antenna gain of 45 dBi , there is TWT backoff loss equal to 4dB, 0.5dB line loss, determine the input power and the EIRP in dB, if the TWT gain equal to 10^4 ,find the input gain of the TWT. (4 degree)

3-a) Derive the relation between the gain of the dish antenna G and the effective aperture area A_e . (4 degree)

3-b) A satellite carrying a 9 GHz continuous wave beacon transmitter is located in geosynchronous orbit 37,586 km from an earth station, the beacon's output power is 0.2 W and feeds an antenna of 24 dB gain toward the earth station ,the receiving diameter antenna is 3. 6 m .

(i)Calculate the satellite EIRP. (ii)Calculate the receiving antenna gain.

(iii)Calculate the space loss. (6 degree)

Faculty of Electronic Engineering
Dept. of Electrical Communication Engineering
2nd term- (4th year)

Subject: Radar Systems
Mid-term Exam
Date: 26/3/2017
Allowed Time: 60 min

Name:.....
Section: .....

Q1. Compare between

1. Search and tracking radar
2. Primary and secondary radar
3. Reflector and phased-array antennas

Q2. Draw the block diagram of pulsed radar and discuss the function of each block.

Q3. A certain C-band radar with the following parameters: Average power P_{avg}=1.5 KW, operating frequency f_o=5.6 GHz, antenna gain G=45 dB, effective temperature T_e=290 K, pulse width τ=0.2 μsec and PRF=50 KHz. The radar threshold is $(SNR)_{min}$=20 dB. Assume target cross section σ=0.5 m^2 and receiver noise figure is 3 dB.

a- Calculate the maximum range.

b- If this radar used in a different environment where the atmospheric attenuation is 0.07 dB/Km, how many pulses are integrated to detect a target at a distance of 80 Km?

Question Four (15 Marks)

A) Draw the block diagram of superhetrodyne receiver in pulsed radar and discuss the function of each block.

(5 Marks)

B) Derive an expression for the radar range equation and discuss the effect receiver noise on the prediction performance.

(5 Marks)

C) **A certain C-band radar with the following parameters:** Average power P_{avg}=1.5 KW, operating frequency f_o=5.6 GHz, antenna gain G=45 dB, effective temperature T_e=290 K, pulse width τ=0.2 μsec and PRF=50 KHz. The radar threshold is $(SNR)_{min}$=20 dB. Assume target cross section σ=0.5 m^2 and receiver noise figure is 3 dB.

a- Calculate the maximum range.

b- If this radar used in a different environment where [illegible]

Menoufia University
Faculty of Electronic Engineering
Dept. of Electronics and Electrical Comm.
4th Year

Subject: Radar Systems
Date: 29/05/2017
Total Test Marks: 60 Marks
Time Allowed: 3 Hours

Answer as much as you can

Question One (15 Marks)

A) Derive an expression for Doppler frequency and relative velocity of the target. **(5 Marks)**

B) Compare between: Conical scan, Sequential Lobbing in tracking radar. **(5 Marks)**

C) Three radar systems has the following parameters:

Radar (a) $\tau = 10\ \mu sec$, $F_n = 8$ dB, threshold is $(SNR)_{min} = 20$dB,
Radar (b) $\tau = 20\ \mu sec$, $F_n = 5$ dB, threshold is $(SNR)_{min} = 20$dB,
Radar (b) $\tau = 50\ \mu sec$, $F_n = 7$ dB, threshold is $(SNR)_{min} = 20$dB,
are used to detect a Target at a distance R, the received power at each radar are $P_{r(a)} = 10^{-12}$ watt, $P_{r(b)} = 10^{-13}$ watt and $P_{r(c)} = 10^{-13}$ watt, $T = 290$ K, $k = 1.38 \times 10^{-23}$ J/K

(1) which radar can detect the target?
(2) For radar which cannot detect, discuss how to improve their detection probability? **(5 Marks)**

Question Two (15 Marks)

A) **What** is the main function of delay line canceller? **Draw** its block diagram and, **Compare** between different types. **(5 Marks)**

B) **Write short notes about:** **(10 Marks)**

1. The butterfly effect
2. Blind speed
3. The target visibility factor
4. Antenna beam-width, band-width
5. Parabolic reflector and phased array antennas

Question # 2 (a. 8 points, b. 4 points, c. 6 points, d. 6 points)

a. Give and explain the functions and requirements of the Data Link Protocol to ensure that frames are delivered free of errors?
b. Explain in details the Piggybacking technique, What is its effect on the communication channel bandwidth.
c. What is meant by pipelining ?. Pipelining over unreliable communication channel raises some serious issues. Explain these issues and show the methods to overcome these issues.
d. Explain the modes of operation of the HDLC protocol.

Question # 3 (a. 8 points, b. 8 points)

One of the main functions of the network layer is the routing problem. An optimum solution can be obtained via a distributed process where each node in the network participate in the routing computation

a. Explain the shortest path routing distributed algorithm.
b. Explain the minimum delay routing distributed algorithm.

2-a)An earth station received a signal from a satellite with carrier power - to -noise ratio of 20 dB ,if the required E_b/N_0 = 9 dB for QPSK and the available bandwidth is 1 MHz , determine

i) the bit rate for the modulation.

ii) ii) the symbol rate of the QPSK .

b) Draw the TVRO receiving only block diagram using satellite system with the corresponding frequencies used.

اسم الطالب:	.....كليه الهندسه الالكترونيه-منوف
رقم الفصل:	.....اختبار: هندسه الاقمار الصناعيه
الرقم الاكاديمى:	.....الفرقه الرابعه اتصالات٢٠١٧/٣/٢٥

Question 1

1) A satellite travels in a circular orbit around the earth at a distance of 35.700 km, calculate: i) the orbital time period (T) ii) the orbit velocity in km/hr (v)

iii) the gravitational force(F_g) .

(where $\mu=GM= 3.99\times10^{14}\ m^3/s^2$, $g = 9.808\ m/sec^2$, $m_s=400kg$, $R_e=6370km$).

Menoufia University
4th Year, Comm. Department
Elective Course
Time Allowed: Three Hours

Faculty of Electronic Engineering
Final Second Term Exam.
Date: 1/06/2017
Total Marks: 70 Marks

Answer the following questions:

1.Derive the method of moment solution for the charge distribution on a perfectly conducting straight thin wire of radius "a", charged to a potential V Volts relative to ground.

2.A Prove that the field from the uniform array is equal to the field of one element multiplied by the array factor.

B. An array of N elements is placed along the X-axis a distance "d" apart. Assuming uniform distribution. Find the progressive phase for broadside and end fire array, and the ratio of the amplitudes of the main beam to the first side lobe.

C. Derive the array factor for planar array.

3.A. Resolving the small square loop with uniform current into four short dipoles, show that the far-field pattern in the plane of the loop is a circle. Calculate the radiation resistance and the directivity.

B. For normal mode helical antenna. Find the condition for circular polarization.

4. Discuss the advantages, disadvantages of microstrip antenna. Draw the various microstrip antenna shapes used in practice. Explain the method of feeding and microstrip antenna applications.

5. A paraboloid-of-revolution converts a spherical wave from an isotropic source at the focus into a plane wave at the aperture, find the relation between the diameter of the antenna, the subtended angle and the focal length.

Good luck

Formula Sheet

The transducer power gain:

$$G_T = \frac{P_L}{P_{avs}} = \frac{|S_{21}|^2\left(1-|\Gamma_S|^2\right)\left(1-|\Gamma_L|^2\right)}{|1-\Gamma_S\Gamma_{in}|^2|1-S_{22}\Gamma_L|^2}$$

The center C_L and radius R_L of the output stability circle:

$$C_L = \frac{(S_{22}-\Delta S_{11}^*)^*}{|S_{22}|^2-|\Delta|^2} \qquad R_L = \left|\frac{S_{12}S_{21}}{|S_{22}|^2-|\Delta|^2}\right|$$

The capacitance per unit cross-sectional area of the diode:

$$C = \varepsilon\left[\frac{q}{12\varepsilon(\phi_C - V)}\right]^{1/3}$$

Manley-Rowe power relations:

$$\sum_{m=0}^{\infty}\sum_{n=-\infty}^{\infty}\frac{mP_{m,n}}{mf_p+nf_S}=0 \quad , \qquad \sum_{m=-\infty}^{\infty}\sum_{n=0}^{\infty}\frac{nP_{m,n}}{mf_p+nf_S}=0$$

Answer the following questions: **(*Full Marks: 70*)**

a) A microwave transistor has the following S parameters $(Z_0 = 50\ \Omega)$: $S_{11} = 0.8\angle -90^\circ, S_{21} = 5.1\angle 80^\circ$, $S_{12} = 0.3\angle 70^\circ, S_{22} = 0.62\angle -40^\circ$. The input of the transistor is connected to a source with an impedance of $Z_S = 25\Omega$, and the output of the transistor is connected to a load of $Z_L = 100\Omega$.
(i) Determine the stability of this transistor by using the $K - \Delta$ test. (3)
(ii) Plot the output stability circle on the Smith chart and show the stable region. (3)
(iii) Determine the unilateral transducer power gain of this transistor (assume $S_{12} = 0.0$). (3)

b) Design a power amplifier at 900 MHz using NPN silicon bipolar transistor with an output power of 3W. For an emitter-collector voltage of $V_{CE} = 24$ V and a collector current of $I_C = 0.5$ A, the output power at the 1 dB compression point is 3.6 W, and the power gain is 12 dB. The large-signal input and output reflection coefficients are given by $\Gamma_s = 0.953\angle 172^\circ, \Gamma_{out} = 0.716\angle -147^\circ$. Design the amplifier for maximum gain and use single-stub matching sections.
(i) Find the required input power (for an output power of 3 W). (2)
(ii) Compute the power added efficiency. (2)
(iii) Design the input and output matching circuits using open-circuited shunt stubs (take the upper intersecting points on the unity circle of the Smith chart for the two matching circuits). (5)
(iv) Sketch the RF circuit of the amplifier and show the value of each element. (2)

2.a) Sketch the equivalent circuit of a quartz crystal, and its input reactance as a function of the frequency. Write the series and parallel resonant frequencies, and show the operating point of the crystal. A particular quartz crystal operating at 10 MHz has equivalent circuit parameters of $R = 30\Omega, C = 27\ fF$ and $C_0 = 5.5\ pF\left(1\ fF = 10^{-15}\ F\right)$. What is the value of the inductance in the equivalent circuit, and what is the Q of this crystal? (7)

b) In a design of a microwave transistor oscillator Γ_T has been chosen to be $\Gamma_T = 0.9\angle 133^\circ$. The S parameters are $(Z_0 = 50\Omega)$: $S_{11} = 0.9\angle -150^\circ, S_{21} = 2.6\angle 50^\circ, S_{12} = 0.2\angle -15^\circ, S_{22} = 0.5\angle -105^\circ$. Determine the load network impedance Z_L. (6)

c) Sketch the circuit diagram of a single-ended diode mixer and derive an expression for the IF output current. (7)

3.a) Define the beam-coupling coefficient and the bunching parameter of a klystron. A two-cavity klystron amplifier has the following parameters: $V_o = 1000\ V$, $\beta_i = 0.95$, $f = 3\ GHz$, $L = 4\ cm$, $J_1(X) = 0.582$ at $X = 1.841$ and e/m $= 1.76 \times 10^{11}$ (MKS system). Find the maximum input voltage V_i. (6)

b) Sketch the schematic diagram of a reflex klystron. A reflex klystron operates under the following conditions: $V_o = 600\ V$, $V_r = 250\ V$, and $f_r = 9\ GHz$. Find the value of the repeller space for which the tube can oscillate in $1\frac{3}{4}$ mode. (6)

c) Show how the wave velocity of the microwave signal is reduced by a helix in a traveling-wave tube (TWT). A TWT operates under the following parameters: $V_o = 3\ kV$, $I_o = 30\ mA$, $f = 10\ GHz$, and $Z_{ac} = 10\ \Omega$. $e/m = 1.76 \times 10^{11}$ (MKS system). Calculate the propagation constant and the wavelength of the forward growing wave. (6)

4.a) Find an expression for the cyclotron angular frequency in a circular magnetron oscillator. A normal circular magnetron has the following parameters: a = 2 mm, b = 4 mm, $B_o = 0.3$ Wb/m^2. Find V_{oc} and the cyclotron frequency in gigahertz. (5)

b) Write an expression for the capacitance of a varactor diode when a pumping voltage $v_p = V_p \cos \omega_p t$ is applied. Apply the Manley-Rowe relations to an up-converting mixer and show that the maximum possible conversion gain is given by $-P_{11}/P_{10} = 1 + f_p/f_s$. In an up-converter parametric amplifier; the figure of merit (γQ) is 10 and the ratio of the output frequency over the signal frequency (f_0/f_s) is 20. Calculate the power gain. What is the power gain as predicted by Manley-Rowe? (7)

V_{DD}=2.5 V , V_{tno}=0.5 V, V_{tpo}= - 0.5V, t_{ox}=500 Å , μ_n=500cm^2/Vs, μ_p=200 cm^2/Vs, K_R=1, $\left(\frac{W}{L}\right)_p = 5$:

a- Draw the CMOS circuit and then find V_{OL} and V_{OH} for CMOS Inverter. Draw the VTC (Voltage Transfer Curve) and Drain current Characteristics Curves.

b- For V_{IH} = 2 V find V_{out}?

c- For $\left(\frac{W}{L}\right)_p = 5$ Find $\left(\frac{W}{L}\right)_n$?

d- Draw Stick and Layout Diagrams. (power 30)

Solve All Questions:

Use color pins in problems 2,3. The exam is Two pages.

Some benefits Constants: $n_i=1.45x10^{10}$, $\varepsilon_{ox}=3.9$ F/cm, $\varepsilon_o=8.85x10^{-14}$ F/cm,

1. The planer technology has six processes remember them and explain two of these processes in brief? (Power 5)

2. Explain the fabrication of nMOS transistor by Self-Aligned Poly-Silicon Gate method? (Power 10)

3. Give the final figure of True Twin Tube n-well CMOS and define the color you used in this figure? (Power 5)

4. For NMOS transistor given:
   Substrate doping density $N_A = 10^{16}$ atoms/cm^3,
   Polysilicon Gate doping density $N_D=2 \times 10^{20}$ cm^{-3},
   Gate oxide thickness t_{ox}=500 Angstrom Å and
   Oxide interface fixed charge $N_{ox}=4x10^{10}$ cm^{-2}.

   Calculate $\varphi_{F(SUB)}$ and $\varphi_{F(Gate)}$ at 300 K, Flat-band voltages VFB, the oxide capacitance Cox, the bulk charge QB and Qox and then calculate the threshold voltage V_{ton}. (Power 10)

5. For the following NMOS and PMOS transistor parameters, Find

Q2:

1- Define with draw the endoscope types

2- Define the function of wireless endoscope. Give example.

3- What are the main parts of the Light Source?

Q3:

1. What are the objectives of the AD590 experiment?

2. How many terminals for the AD590device? Define them.

3. The AD590 input is.....and output is .....

4. AD590: Temp range from ..... to .....

Q1:

1. Explain the following lines from a MATLAB program:

   a. **I = imread('cell.tif');**

   b. **figure, imshow(I), title('original image');**

   c. **[junk threshold] = edge(I, 'sobel');**

   d. **fudgeFactor = .5;**

   e. **BWs = edge(I,'sobel', threshold * fudgeFactor);**

   f. **figure, imshow(BWs), title('binary gradient mask');**

2. According to your studies; Draw the output from line b and line f.

3. Define the following:

   1. **Thresholding**
   2. **Erode**
   3. **Histogram**

4- What is the best technique in image segmentation?

a)	Sketch the current distribution on an infinitesimal dipole, and the current distribution on a short dipole. **[5 Marks]**
b)	A dipole of length 2 meter is radiating a total power of 10 watts and operating at a frequency of 25 MHz: find the current at the input port of such dipole. Determine the strength of the electric and the magnetic fields at a distance of 20 meters from the dipole and in the direction of an angle of 60° from the axisof the dipole. (Indicate that your answer is giving the rms value or the peak value). **[10 Marks]**
a)	What are the privileges of a half-wave dipole? **[5 Marks]**
b)	A half-wave dipole of length 6 meters; what is the operating frequency of such dipole? Determine the current at the input of this dipole if the total power radiated is 20 Watts. What are the electric field strength and the magnetic field strength (rms values) at an angle of 60° from the dipole and a distance of 30 meters? **[10 Marks]**

1-	a)	What is a transmitting antenna? Also, what is a receiving antenna? [4 Marks]
	b)	What are the main functions of an antenna? [3 Marks]
	c)	What is an aperture antenna? Sketch two differentforms of aperture antennas.[4 Marks]
	d)	Sketch an antenna used for radiobroadcasting in the medium wave band. What is the polarization of such antenna?[4 Marks]
2-	a)	A half-wave dipole is fed at its middle port by a current given by $I_{in} = \hat{I} \sin \omega t$ Sketch the instantaneous current distribution along the dipole at: i) $t = 0$ sec. ii) $t = \frac{T}{8}$ sec. iii) $t = \frac{T}{4}$ sec. iv) $t = \frac{T}{2}$ sec. v) $t = \frac{3T}{4}$ sec. where T is the period of one full cycle. [5 Marks]
	b)	A hypothetical isotropic antenna is radiating 100 Watts in free-space. Determine the electric field and magnetic field intensities at a distance of 50 meters from the antenna. [10 Marks]
3-	a)	Sketch a general directive radiation pattern, and name all its components on the drawing. [5 Marks]
	b)	Find the half-power beam-width (HPBW) and first-null beam-width (FNBW), *in radians and degrees*, for the following normalized radiation intensities: (a) $U(\theta) = \sin \theta$ (b) $U(\theta) = \sin^2 \theta$ [10 Marks]

b) For the following frequency distribution:

x_i	30	32	34	36	38	40
f_i	7	18	29	30	14	7

Find : i) Draw the histogram ii) Mean, iii) Median, iv) Lower quartile,
v) Higher quartile Mode, vi) Standard deviation, vii) Skewness, viii) Kurtosis

c) Optimize the function $y = 0.16x_1+0.14x_2$ with the constraint (x_1,x_2 are positive)

$x_1 + x_2 < 20$, $x_1 + 4x_2 < 60$ and $4x_1 + 3x_2 \leq 72$

Question 4 ***(9 Marks)***

a) A random continuous variable x has the following density function, $f(x) = Ae^{-30x}$, $0 \leq x \leq \infty$ Find:
i) A and F(x) ii) The mean value and the variance iii) The most probable variable x_m and its densi
iv) $P(0.5x_m \leq x \leq 1.5x_m)$

b) The joint density function of two random variable x and y is given by: $f(x) = cxy$, $0 \leq x \geq 4$, $1 \leq y \leq 5$
Find: i) The value of c ii) $P(1 \leq x \leq 2,\ 2 \leq y \leq 3)$, iii) Marginal distribution functions. Iv) Marginal density functions

c) There are two production centers P_1 and P_2 each produce 300 items, there are also three distribution cente
D_1, D_2 and D_3 which distribute 200, 150, and 250 items. The costs from each P to each D are as given:

	D_1	D_2	D_3
P_1	50	150	200
P_2	50	200	50

Find the best method of distribution (which gives minimum cost)

	Acd. Year:	2016/2017	Menoufia University			
	Semester:	2nd	Faculty of Electronic Engineering			
	Year:	Fourth	Department of Electronics and Electrical Communicatio Engineering			
	Time:	2 H	Course Title:	Economic Engineering		
	Examiners:	Prof. Abd-Elnaser A. Mohamed	Date:	8 /6/ 2017	Course Code:	
	Final term Exam					
Answer The Following Questions			No. of questions: 4			

Question 1 *(8 Marks)*

السؤال الاول:

١) أكتب نبذة مختصرة عن الآتى:

أ) الموارد الاقتصادية ب) الاقتصاد الكلى والجزئى ج) الشركات واهم شروطها

د) الدراسة الفنية والهندسية للمشروع هـ) السلع (البديلة - المكملة - المستقلة)

٢) أذكر الآتى:

أ) أهم العناصر التى تشتمل عليها دراسة الوضع الاقتصادى العام لأى دولة

ب) اهم خطوات تحسين الجودة

ج) ما هى العوامل التى يتم بها اختيار موقع لمشروع معين

د) ما هو الاستهلاك مع ذكر انواعة

٣) تكلم عن الآتى:

أ) ما هى المرونة وما هى انواعها

ب) ما هو مفهوم الجودة مع ذكر اهم شروط تحقيق الجودة

٤) ما هى انواع دوال التوزيع المستمر والمتقطع

Question 2 *(10 Marks)*

a) Draw the answer area can be existed the following:

$x \geq 0.0$, $y \geq 0.0$, $y \leq 30.0$, $x \leq 30.0$, $x + y \geq 15$, and $x + y \leq 30$

b) Find the correlation of the following two phenomena

x	10	12	14	16	18
y	20	30	40	50	60

c) The cost C of a product which depends on two Causes A and B is given by:

$$C = C_o\left(A^2 - 60A + 700\right)\left(B^2 - 120B + 9000\right)$$

1) Optimize C (find A^*, B^* and C^*). 2) Find S_A^C and S_B^C at: i) A^* and B^*, ii) $0.5A^*$ and $0.5B^*$

d) The following table is the frequency distribution of the weights of 100 student in Lb. Find the mean and the standard deviation.

Centre of interval x	115	125	135	145	155	165	175	185
Frequency	2	12	12	25	27	10	9	3

Question 3 *(8 Marks)*

a) For the following points:

x	10	20	30	40	50	60
y	10	30	40	30	40	20

Use the least squares to fit: i) Straight line ii) parabola

Question #3

Explain the basic Automatic Repeat Request (ARQ) methods f or dealing with errors in thr presence of pipelining.

Question #4

a. explain the HLDC Frame Format .

b. Give the HDLC frame types and explain how they are identified.

Question #1

a. Describe the types and functions of network addressable units (NAU) in the IBM's system.

b. Compare the network architecture of the DECNET with that of the OSI reference model.

8. Whereas ..... requires a specially constructed optical fiber for its operation, ... amplifier makes use of the transmission fiber itself as the amplification medium.
   a) raman, EDFA b) laser, EDFA c) EDFA, raman d) raman, laser

9. An optical ..... is a nonreciprocal multiport passive device that directs light sequentially from port to port in .....
   a) circulator, one direction b) circulator, two directions c) isolator, one direction
   d) FBG, one direction

10. ..... is a passive optical device whereas ..... is an active optical device.
   a) Laser, FBG b) FBG, laser c) EDFA, MZI d) MZM, MZI

11. ..... differs in their design from that of .....mainly in one respect: an additional layer is added in which secondary electron-hole pairs are generated through impact ionization.
   a) LED, laser b) Laser, LED c) APD, pin d) pin, APD

12. One of the motivation behind using the ..... communication techniques is: The receiver sensitivity can be improved by up to 20 dB compared with that of .....systems.
   a) coherent, IM/DD b) IM/DD, OOK c) coherent, BPSK d) IM/DD, coherent

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QUESTION 6 (12 Points):

Design an optical analog communication system that transmit a video signal from a transmitter to a remote receiver. The video signal has a bandwidth of 6 MHz over a 700-m path. The video signal is to intensity-modulate the light source with 100% modulation. The SNR at the receiver must be 50 dB or more. where T=300° K, e=1.6 x 10^{-19} coulombs, and k_B=1.38 x 10^{-23} m^2 kg s^{-2} K^{-1}. In addition to the design what is the suitable configuration for the above system. In your design assume the following:

1. The type of the source is surface-emitting LED: P_{LS} = 1 mW = 0 dBm, λ = 0.85 μm, τ_{LS} = 12 ns.
2. The type of the fiber is multimode step index fiber: NA = 0.24, τ_{mod}/L=13.3 ns/km, τ_{chr}/L= -3.22 ns/km, and α_f = 5 dB/km.
3. The type of the detector is Si p-i-n photodiode: R = 0.6 at λ = 0.85 μm, I_D = 10 nA, τ_{drift} = 0.1 ns, C_d =5 pF, and V_B = 5 V.
4. Reflection loss=0.18 dB, connector loss=1 dB, system loss margin of l_m=6 dB.

With My Best Wishes

QUESTION 5 (24 Points):

Select the correct answer.

1. The intermediate frequency equals ……when we use .....detection technique.
   a) zero, homodyne b) zero, heterodyne c) 1 GHZ, homodyne d) 0.1 GHZ, homodyne

2. Coherent detection makes use of a local oscillator and can be implemented in two ways: …….. and …….. schemes.
   a) OOK and direct-detection b) optical delay demodulation and OOK
   c) homodyne and heterodyne d) optical delay demodulation and direct-detection

3. The use of format permits

QUESTION 1 (24 Points):

Determine whether the following statements are true or false. Write down your reasons in brief.

1. It is the stimulated emission process, which gives the laser its special properties as an optical source.

2. Incident ray into the fiber core at an angle greater than 0_a will be transmitted to the core-cladding interface at an angle greater than ϕ_c, and will be totally internally reflected.

3. In the case of OOK, information is encoded in the bit phase.

4. In case of QPSK encoding: a scheme known as optical delay demodulation can be employed at the receiver.

5. A balanced receiver has a 3-dB power penalty compared to any single-port receiver.

6. Applying the same voltages to the two arms of MZM produces optical phase modulation to the input signal.

7. When the average received power is increased in an optical communication system, its quality of service (QoS) improves and approaches the shot noise limited case.

8. In heterodyne receivers, noise is dominated by shot noise if the local-oscillator power P_{LO} is large enough, that is $P_{LO} \gg \frac{\sigma_t^2}{2e\mathcal{R}\Delta f}$, where σ_s^2 is the shot-noise variance, $\mathcal{R}$ is the responsivity, Δf is the bandwidth, and e is the electron charge.

9. The NEP is defined as the minimum optical power per unit bandwidth required to produce equal signal and noise currents.

10. Direct detection does not allow phase modulation.

11. By adjusting the parameters of directional coupler so that the throughput power equal to zero, one creates a 0-dB coupler.

12. If the APD gain M = 0, then the APD photodiode will work as a p-i-n photodiode.

Answer the following questions:

1-a- A company advertise its requirement for 4 engineers, 20 engineer applied for this gob. Calculate the amount of information obtained in selecting the required engineers.

b- A sensing device gives one of eight readings every 2 minutes. The sensing values probabilities are such that; $P(x_1) = P(x_4) = P(x_7) = \frac{1}{20}$, $P(x_2) = P(x_3) = \frac{1}{10}$, $P(x_6) = P(x_8) = \frac{1}{5}$, $P(x_5) = \frac{1}{4}$,

i- Determine the capacity of this sensing device,

ii- Obtain an efficient code, and calculate its variance, **[12]**

2- Compare between;

a- The mutual information between two symbols and the sum of their information values,

b- The conditioned entropy and the unconditioned entropy, defining the situation of their equality. **[10]**

3- a- Compare between the following two discrete channels;

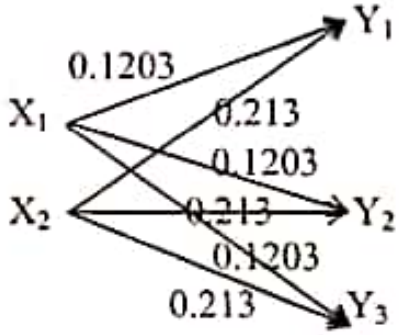
-The first channel has the following matrix,

0.15	.....	0.5
0.2	0.25	.....
.....	0.6	0.15
.....	0.16	0.17

with source probabilities; [....., 0.18, 0.3, 0.24]

-The second channel has the following diagram;

with the 1st input symbol probability is twice that of the 2nd symbol,



b- For the 1st channel calculate;

i- The probability of error,

ii- Construct the channel matrix of the opposite channel type,

c- For the 2nd channel define its type and calculate its capacity. **[15]**

4- An information source generates digital signal with bit rate 80 kbps. The o/p of this source is to be transmitted over a continuous noisy channel with a BW of 10 kHz and SNR of 20 dB;

a- Compare between the information rate of this source and the channel capacity,

b- Find the SNR required for transmission over this channel,

c- Find the BW required for transmission over this channel with SNR 20 dB. **[15]**

Question 3: (14 Marks)

3-aDraw DAB digital audio broadcasting receiver block schematic, explain briefly the function of each block

3-b Explain using block diagram the function of Digital Front-end audio receiver architectures and interfaces

Q5-) Multiple choice Questions (6 points)

1. What is the first DHCP message sent by a client attempting to obtain IP address information from a DHCP server?
a. DHCPOFFER
b. DHCPACK
c. DHCPDISCOVER
d. DHCPREQUEST

2. Which of the following statements are true regarding VLANs? (Choose two.)
a. A VLAN has a single broadcast domain.
b. For traffic to pass between two VLANs, that traffic must be routed.
c. Because of a switch's MAC address table, traffic does not need to be routed to pass between two VLANs.
d. A VLAN has a single collision domain.

3. A client with an IP address of 172.16.18.5/18 belongs to what network?
a. 172.16.0.0/18
b. 172.16.4.0/18
c. 172.16.8.0/18
d. 172.16.16.0/18

4. What type of RJ45 UTP cable is used between switches?
a. Straight-through
b. Crossover cable
c. Crossover with a CSU/DSU
d. Crossover with a router in between the two switches

5. In which of the following technologies is the term *HFC* used?
a. DSL
b. PPPoE
c. Frame Relay
d. Cable
e. Wireless
f. POTS

Menoufia University

Faculty of Electronic Engineering

4th year Exam . Jan. 2017

Time Allowed: 3 Hrs .

Department of Electronics and Electrical Communications Engineering

Computer Networks- Code: EEC414

Answer All Questions	Number of Questions: 5	Number of Pages: 2

Answer the following questions:

Q1-)

Differentiate between: (25 points)

1- An end-user devices and Network devices?
2- Collision and broadcast domain?
3- A bridge and a switch, a multilayer switch and a router?
4- Thick net and thin net, 2- 10 Base5 and 10 Base T?
5- Analog and digital modem?
6- PAP and CHAP authentication method (to perform PPP authentication - indicate with drawing)?

Q2-) (25 points)

1- Mention three WAN technologies commonly use unshielded twisted pair (UTP)?

2- Classify the different types of connections that can use full duplex mode / half duplex mode? Then determine which of them operates in: a private collision domain / a shared collision domain?

3- What locally significant identifier is used by a Frame Relay network to reference a virtual circuit?

4- Which switching method allows for data transmissions even when part of the network fails?

5- In which area networking environments is ATM usable?

6- What are the greatest functions of the OSI specifications?

7- Determine the different WLAN standards from the view point of: 1- data rate, 2- band used, and 3- transmission method?

8- Mention the three categories of a WAN connection? Then list the technology used with each of these categories?

Q3-) List the three different network models? Then explain the functions of each of the seven layers (reference model) which are concerned with? (15 points)

Q4-a) Explain what is meant by: (19 points)

1- *Demarcation point?,*

2- Smart jack? and 3- CIR?

Q4-b) Draw and explain each field of the structure of ATM cell?