

Course	Wave Propagation & Antennas (1)	Academic year 2021/2022 First Semester Exam	Course Code	EEC 3110
Year	3 rd Year		Total Marks	90
Date	22/1/2022 (Final Exam)	No. of pages: (2) Pages	Allowed Time	3 hrs
Remarks: Answer ALL of the following Questions.				

Question # I:**(45 Points)**

- (1) Draw the lumped element circuit model for a transmission line and write the general expressions for both voltage and current distributions $V(z)$ and $I(z)$, Then drive expressions for α, β, Z_0 for a lossless transmission line. **(10 Points)**
- (2) Write down an expression for Z_{in} of the transmission line then derive an expressions for input impedance in the cases of short circuit line and open circuit line then sketch them showing the main applications of these lines. **(10 Points)**
- (3) Prove that for any TL, the sending end voltage is given by:

$$V_s = \frac{I_l}{\sqrt{1 - \tanh^2(\gamma l)}} (Z_l + Z_0 \tanh(\gamma l))$$

where γ is the propagation constant, l is the length of the line, Z_l is the terminating impedance, Z_0 is the characteristic impedance, and I_l is the current in the terminating impedance. **(10 Points)**

- (4) For a radio frequency lossless T.L. with $l = 6m$ and operating at $f = 300MHz$ with parameters $L = 10mh/m$, $C = 4\mu F/m$ and the reflection coefficient at the load $\Gamma_L = 0.4\sqrt{3} + j0.4$ obtain the values of: $Z_0, Z_L, VSWR, Z_{in}, d_{1max}, d_{1min}, Z_{max}, Z_{min}, Z$ at 2.5m from the load. Then design a single open-circuit shunt-stub to match the line to the load. Explain if we can able to achieve impedance matching using the quarter-wavelength transformer or not? **(15 Points)**

Question # II:**(45 Points)**

- (1) An air-filled parallel-plate waveguide has $w = 100mm$, $d = 25mm$ operating for TEM mode at 500 MHz. Calculate the following: **(10 Points)**
- Voltage between the two plates assume $V_0 = 2V$ and Current flow through the conductor.
 - Field components, TEM wave impedance, characteristic impedance, and phase velocity
- (2) For air-filled parallel plates waveguide operating in the TM mode derive an expression for the longitudinal field component then determine the dominant mode of the waveguide. **(10 Points)**

(3) Write down expressions for the different field components in a rectangular wave guide operating in the overall dominant mode. Then, derive an expression for the transmitted power P_0 and the attenuation coefficient. (10 Points)

(4) A rectangular waveguide extends from $x = 0$ to $x = 5$ cm and from $y = 0$ to $y = 4$ cm. It is filled with a lossy-dielectric material with $\epsilon_r = 16$ and $\sigma_d = 10^{-5} \text{ v/m}$ and the walls losses is neglected. The longitudinal magnetic field component (H_z) in the WG is given by:

$$H_z(x, y, z, t) = 10^{-4} e^{-\alpha z} \cos(40\pi x) \cos(12\pi \times 10^9 t - \beta z) \text{ A/m}$$

(15 Points)

Calculate

- The mode of operation, cut-off frequency, α_d , α_c , β , k , k_c , v_p , v_g , wave impedance.
- The expressions for remaining field components.
- The time averaged power transmitted by the waveguide.

Constants:

$$\epsilon_0 = 8.85 \times 10^{-12} \text{ F/m}, \mu_0 = 4\pi \times 10^{-7} \text{ H/m}, c = 3 \times 10^8 \text{ m/s.}$$

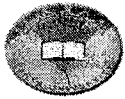
End of Questions

Good Luck

Course Examination Committee:

Prof. Mostafa Mahmoud
Prof. Mohamed Nasr
Prof. Mahmoud A. Attia

Course Coordinator: Dr. Hussein E. Seleem



Tanta University

Electronics and Electrical Communications Department



Faculty of Engineering

Course	Digital Electronics in Communication Systems	Academic year 2021/2022 First Semester Exam	Course Code	EEC 3111
Year	3 rd Year		Total Marks	90
Date	15/1/2022 (Final Exam)	No. of pages: (3) Pages	Allowed Time	3 hrs
Remarks: Answer ALL of the following Questions.				

Question # I:

(30 Points)

- (1) Compare Between TTL and CMOS logic families in terms of speed, power consumptions, propagation delay, Fanout and size. **(6 Points)**
- (2) What effect did Schottky-clamped transistor have on the operation of standard TTL ICs? **(6 Points)**
- (3) What precautions should be taken when handling CMOS ICs? **(6 Points)**
- (4) A 74ALS00 NAND gate output is driving three 74S gate inputs and one 7406 input. Using data from Table 1, determine if there is a loading problem. **(6 Points)**

TTL Series	Outputs		Inputs	
	I_{OH}	I_{OL}	I_{BI}	I_{IL}
74	-0.4 mA	16 mA	40 μ A	-1.6 mA
74S	-1 mA	20 mA	50 μ A	-2 mA
74ALS	-0.4 mA	8 mA	20 μ A	-0.1 mA

- (5) Two different logic circuits have the characteristics shown in Table 2. **(6 Points)**

- (a) Which circuit has the best LOW-state DC noise immunity?
- (b) Which circuit has the best HIGH-state DC noise immunity?
- (c) Which circuit can operate at higher frequencies?
- (d) Which circuit draws the most supply current?

	Circuit A	Circuit B
V_{supply}	6 V	5 V
$V_{IH}(min)$	1.6 V	1.8 V
$V_{IL}(max)$	0.9 V	0.7 V
$V_{OH}(min)$	2.2 V	2.5 V
$V_{OL}(max)$	0.4 V	0.3 V
t_{PLH}	10 ns	18 ns
t_{PHL}	8 ns	14 ns
P_D	16 mW	10 mW

Question # II:

(30 Points)

- (1) Design a BCD to 7-segment decoder then draw its logic circuit. **(6 Points)**
- (2) Design the following function: $F = \overline{A}B + A\overline{B}$ using: **(6 Points)**
 - (i) An 4-to-1 multiplexer (MUX).

(ii) A decoder with tristate buffers.

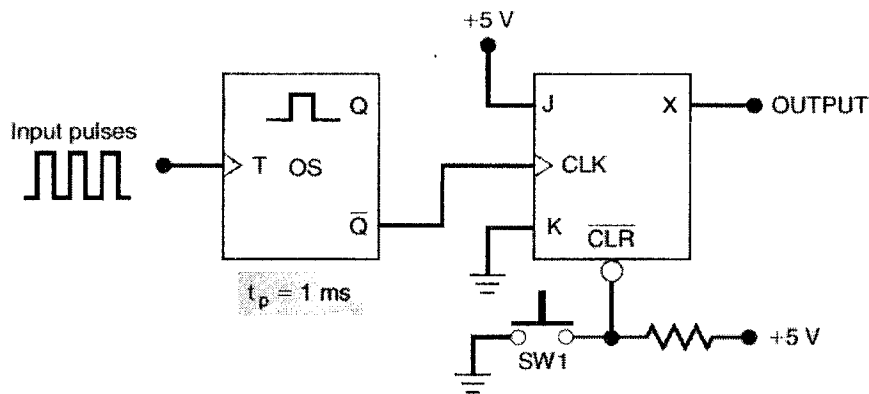
(3) For each statement indicate what type of FF is being described. (6 Points)

- i. Has a SET and a CLEAR input but does not have a CLK input
- ii. Will toggle on each CLK pulse when its control inputs are both HIGH
- iii. Has an ENABLE input instead of a CLK input
- iv. Has only one control input
- v. Is used to transfer data easily from one FF register to another
- vi. Can change states only on the active transition of CLK

(4) Draw the circuit diagram of the SR latch using NAND gates indicating its truth table and its excitation table. Then, show how can you convert SR latch to JK flip-flop. (6 Points)

(5) A retriggerable OS can be used as a pulse-frequency detector that detects when the frequency of a pulse input is below a predetermined value. A simple example of this application is shown in Fig. 1. The operation begins by momentarily closing switch SW1. (6 Points)

- (i) Describe how the circuit responds to input frequencies above 1kHz.
- (ii) Describe how the circuit responds to input frequencies below 1kHz.
- (iii) How would you modify the circuit to detect when the input frequency drops below 50 kHz?

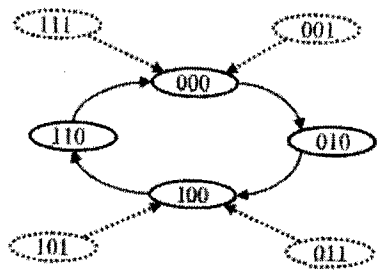


Question # III: (30 Points)

(1) Design a 3-bit binary ripple down-counter. Draw the timing diagram and discuss the problems of this type of counters. (6 Points)

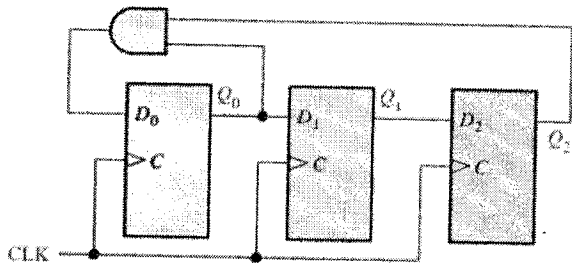
(2) Design a 3-bit Johnson counter and draw its timing diagram for a period of 6 CLK pulses. If the counting sequence is to be reduced from 6 to 5 by the omission of the 111 state, determine the modification of the feed back logic that is required. (6 Points)

(3) It is required to design a synchronous counter that satisfies state diagram in Fig. 2. Also draw the timing diagram and determine the ratio between the frequency of each FF and the clock frequency. (6 Points)



(4) Design a 6-bit Serial-In Serial-Out (SISO) shift left register. If it is clocked at 40 kHz, How long will the data be delayed in passing through this register? (6 Points)

(5) Determine the counting sequence of the counter in Fig. 3. (6 Points)



End of Questions

Good Luck

Course Examination Committee:

- Asoc. Prof. Amira Ashour
- Asoc. Prof. Mahmoud Selim
- Dr. Nessim Mahmoud

Course Coordinator: Dr. Hussein E. Seleem

Answer ALL the following questions.

(يقوم الطالب بإجابة السؤال الأول في ورقة التصحيح الإلكتروني وباقي الأسئلة في الكراسة)

Model A

Question (1): Choose the correct answer (40 Marks)

- Which of the following is perceptron?
 - a neural network that contains feedback
 - an auto-associative neural network
 - a double layer auto-associative neural network
 - a single layer feed-forward neural network with pre-processing
 - None of these
- Which of the following is limited to be used with linearly separable binary classification problems?
 - Convolutional Neural Network (CNN)
 - Multi-layer perceptron
 - Single-layer perceptron
 - Recurrent Neural Network (RNN)
- models aim to learn the structure of underlying data by learning the joint probability distribution $p(x, y)$ where x is the observable variable and y is the target variable.
 - Classification
 - Regression
 - Generative
 - Discriminative
- During GAN training, if the generator G model becomes perfect, then the accuracy of discriminator model D would be
 - 0%
 - 50%
 - 75%
 - 100%
- During GAN training, the objective of generator model G is to
 - Minimize classification error for the discriminator
 - Maximize classification error for the discriminator
 - Maximize $\log(1-D(G(z)))$ where z is a noise vector.
 - Minimize $\log(D(G(z)))$ where z is a noise vector
- To which of these tasks would you apply a many-to-one RNN architecture?
 - Speech recognition (input an audio clip and output a transcript)
 - Sentiment classification (input a piece of text and output a 0/1 to denote positive or negative sentiment)
 - Caption generation (input an image and output a sentence)
 - Machine translation (input a sentence and output different sentence in another language)
- Which of the following is NOT true about recurrent neural networks?
 - RNNs can handle inputs with different lengths.
 - RNN model uses a different set of weights for each time step
 - The length of the RNN model output could be the same length as its input.
 - RNN model training may suffer from exploding gradient problems.
- While applying a 3x3 convolution filter to an input feature map of height and width 28x28 with stride=2 and 1-pixel padding is applied, the output feature map height and width is?
 - 28x28
 - 26x26
 - 14x14
 - 13x13

9. Which of the following is true about the Convolution layer?

- The number of weights depends on the depth of the input volume
- The number of weights depends on the height and width of the input volume
- The number of weights depends on the stride
- The number of weights depends on the padding

10. In Delta Rule for error minimization

- Weights are adjusted w.r.t to change in the output
- Weights are adjusted w.r.t to difference between the desired output and actual output
- Weights are adjusted w.r.t to difference between input and output
- None of the above

11. Which of the following can be used for clustering of data?

- Single-layer perceptron
- Multi-layer perceptron
- Self-organizing map (SOM)
- Convolutional Neural Network (CNN)

12. While evaluating a classifier for spam message detection. The evaluation dataset is unbalanced as it contains 100 spam examples and 900 ham (non-spam) examples. If the classifier just predicts all messages as spam what are the evaluation metrics of that classifier as measured on the given evaluation dataset?

- Accuracy: 90%, recall: 10%
- Accuracy: 10%, recall: 10%
- Accuracy: 100%, recall: 10%
- Accuracy: 10%, recall: 100%

13. Using activation functions could reduce the occurrence of vanishing gradients in very deep neural networks.

- Sigmoid
- Tanh
- ReLU
- Softmax

14. For a binary classification problem, which of the following activation function is used?

- ReLU
- Softmax
- Sigmoid
- None

15. For an image classification task, which of the following deep learning algorithm is best suited?

- Recurrent Neural Network
- Multi-Layer Perceptron
- Convolution Neural Network
- All of the above

16. Which of the following is a correct order for the Convolutional Neural Network operation?

- Convolution \rightarrow max pooling \rightarrow flattening \rightarrow full connection
- Max pooling \rightarrow convolution \rightarrow flattening \rightarrow full connection
- Flattening \rightarrow max pooling \rightarrow convolution \rightarrow full connection
- None

17. Autoencoder is used for

- Image classification
- Speech classification
- Function approximation
- Dimensionality reduction

18. can be used to handle exploding gradient problem.

- LSTMs or GRUs
- Dropout
- Gradient clipping
- Regularization

19. In autoencoder training, the target output is

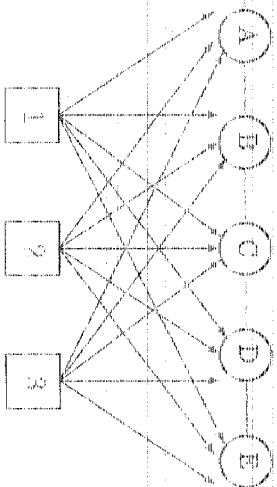
- A fixed constant
- Identical to input
- A positive real number
- Could be either positive or negative real number

20. A 3-input neuron has weights 2, 1.5, and 0.6, the neuron output s is 0.7, and the activation function is bipolar sigmoid. If the inputs are 0.5, -1, and 0.3, respectively, the bias weight b is:

- 2
- 1.17
- 0.85
- 1

Question (4) (15 Marks)

1. Suppose that the following SOM is used to classify types of airplanes based on three parameters: Size, Speed and Passenger load. (9 Marks)



Node	A	B	C	D	E
M1	3	5	1	2	5
N2	2	3	5	3	2
N3	5	5	1	2	5

The weights of the output nodes are shown in the table below:

Each of the three parameters is assessed on a scale from 1 to 5. For example, small airplanes have size 1, while huge planes would have value 5. Each plane is represented as a three-dimensional vector with coordinates corresponding to these three parameters.

Answer the following questions:

- How many types of planes can this SOM classify?
- Which node will be the winner, if a vector representing a fighter jet (Input Feature Vector: 1, 5, 1) is fed into the input?
- Which node will be the winner, if a vector representing a jumbo passenger jet (5, 3, 5) is fed into the input?
- Suppose you were asked to change the design of the SOM in order to take into account two additional parameters: Price and Fuel consumption. What would you need to change in this SOM?
- Describe the algorithm responsible for the formation of the self-organizing map.
- What are the terms **ROC** and **AUC** stand for? What is AUC used for? Describe in detail. (2 Marks)
- Given the following confusion matrix obtained from testing a trained binary classifier, evaluate the classifier using the following metrics: (4 Marks)

Actual	Predicted	
	Negative	Positive
Negative	12 (TN)	2 (FP)
Positive	8 (FN)	18 (TP)

- Accuracy
- Recall
- Specificity
- Error

Best Wishes,

Dr. Amr ElKhalvy

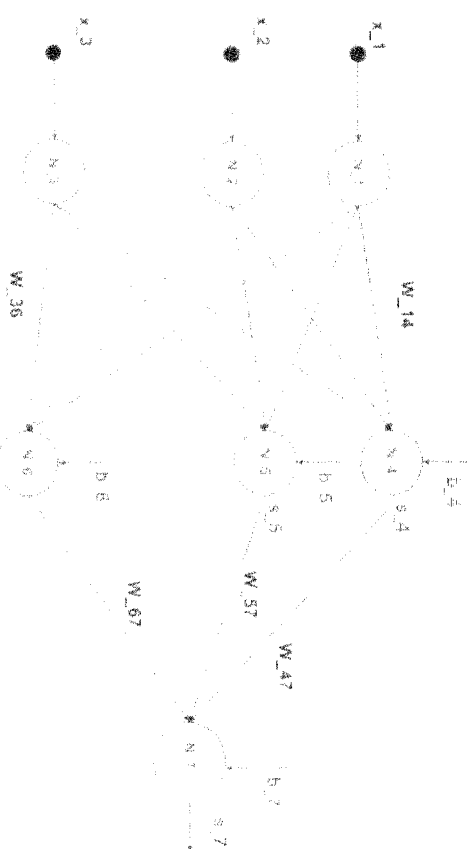
DR. Mostafa Elzantot

Question (2) (15 Marks)

Design a neural network with two inputs x_1 and x_2 , and a single output neuron that acts as a binary classifier in the x_1 - x_2 plane. Class e_1 (i.e., $S=0$) represents all input patterns inside a triangle with vertices (1,1), (4,2), and (3,4), while Class e_2 (i.e., $S=1$) represents all input patterns fall outside that triangle. Show how the designed network will classify the following input patterns: (1,2), (2,1), and (3,2).

Question (3) (15 Marks)

For the given neural network, the Input layer consists of neurons N1, N2 and N3 which copy their input into the network. Output layer consists of a single neuron N7 which produces the final output of the network. Network includes a single hidden layer with 3 neurons. All hidden layer neurons use a "sigmoid" activation function while the output layer neuron uses a linear "identity" activation function.



Assume the training error energy function used is the half-squared error. $E = \frac{1}{2} (d - s_7)^2$ E Where d is the desired output and S_7 is the actual output.

Weights are identified by their name where the weight parameter W_{ij} connects neuron i to neuron j . Bias weights to neuron i are also identified by its name b_i .

The network weights are given as follows:

$$\begin{array}{llll}
 W_{14} = 0.2 & , & W_{24} = -0.8 & , & W_{34} = 0.18 & , & b_4 = -0.5 \\
 W_{15} = 0.6 & , & W_{25} = 0.7 & , & W_{35} = 0.9 & , & b_5 = 0.3 \\
 W_{16} = -0.4 & , & W_{26} = -0.3 & , & W_{36} = -0.56 & , & b_6 = 0.2 \\
 W_{47} = -0.25 & , & W_{57} = -0.5 & , & W_{67} = 0.8 & , & b_7 = 1.5
 \end{array}$$

When the following input $[x_1 = 0.1, x_2 = 0.3, x_3 = -0.5]$ with target output ($d=0.4$) is applied to the network.

- What is the output of the network?
- Find $\left(\frac{dE}{dW_{14}}\right)$ the gradient of error E with respect to weight parameter W_{14} .
- Find $\left(\frac{dE}{db_4}\right)$ the gradient of error E with respect to bias weight the parameter b_4 .



Course Title: Probability Theory
Date: 18-1-2022 (First term)

Course Code: PME3115 (3rd communication)
Allowed time: 3 Hrs

Year: 2021/2022
No. of Pages: (3)

Remarks: Answer All of the Following Questions

Question Number (1):

- a) It is known that of the articles produced by a factory, 20% come from Machine A, 30% from Machine B, and 50% from Machine C. The percentages of satisfactory articles among those produced are 95% for A, 85% for B and 90% for C. An article is chosen at random.
- I. What is the probability that it is satisfactory?
 - II. Assuming that the article is satisfactory, what is the probability that it was produced by Machine A?
- b) A sample of 30 electrical components was tested by operating each component continuously until it failed. The time to the nearest hour at which each component failed was recorded as follow
- 31, 41, 46, 33, 44, 51, 56, 63, 71, 71, 62, 63, 54, 53, 51, 43, 36, 38, 54, 56, 66, 71, 74, 75, 46, 47, 59, 60, 61, 63**
- I. Make a frequency table for this data using open class intervals with width 5.
 - II. Draw the frequency histogram, frequency polygon and O-give.
 - III. Find mean, standard deviation, median and mode of the data in the grouped frequency distribution.
- c) In a group of 72 students, 14 take neither English nor chemistry, 42 take English and 38 take Chemistry. What is the probability that a student chosen at random from this group takes :
- I. both English and Chemistry?
 - II. Chemistry but not English?
 - III. English if he didn't take Chemistry?

Question Number (2)

a) Given $f(x) = \begin{cases} \frac{k}{x^2} & 1 \leq x < 3 \\ 0 & \text{otherwise} \end{cases}$, determine the value of k that will make $f(x)$ a probability density function.

- I. Find the cumulative probability distribution function $F(x)$ and use it to determine $P(2 \leq X < 3)$.
- II. Find the probability that X is exactly equal to 2.
- III. Find the mean and standard deviation of this probability distribution.
- IV. Find $E[(3X + 1)^2]$ and $V(X - 2)$.

b) The average zinc concentration recovered from a sample of measurements taken in 36 different locations in a river is found to be **2.6** grams per millilitre. Construct **95% confidence interval** for the mean zinc concentration in the river if the population standard deviation is **0.3** gram per millilitre.

c) The average number of collisions occurring in a week during the summer months at a particular intersection is **2**. Assume that the requirements of the **Poisson distribution** are satisfied.

- I. What is the probability of no collisions in any particular week?
- II. What is the probability that there will be exactly two collisions in a week?
- III. What is the probability of finding more than two collisions in a week?

Question Number (3)

a) A metal rod was gradually heated and its length was measured at various temperatures as follow

Temperature	15	20	25	30	35	50	70
length	2.1	2.6	2.9	3.3	4	5.1	7

- I. Draw the scatter diagram for this data.
 - II. Compute the linear correlation coefficient r and determine its type.
 - III. Find the linear prediction equation then estimate rod length at temperature 33.
- b) An electric institute published figures on the number of kilowatt hours used annually by various home appliances. It is claimed that a vacuum cleaner uses an average of 46 kilowatt hours per year. Test the hypothesis that $\mu = 46$ kilowatt hours per year against the alternative that $\mu \neq 46$ kilowatt hours per year if a random sample of 12 homes included in a planned study indicates that vacuum cleaners use an average of 42 kilowatt hours per year with a standard deviation of 11.9 kilowatt hours per year. Use a **0.05** level of significance.
- c) A city installs 2000 electric lamps for street lighting. These lamps have a mean burning life of 1000 hours with a standard deviation of 200 hours. The normal distribution is a close approximation to this case.
- I. What is the probability that a lamp will fail in the first 700 burning hours?
 - II. How many lamps are expected to fail between 900 and 1300 burning hours?
 - III. After how many burning hours would we expect 10% of the lamps to be left?

With my best wishes

Course Coordinator **Dr. Eng. Eman Elghamry**

v	α									
	0.1	0.05	0.025	0.01	0.005	0.001	0.0005			
1	3.078	6.314	12.076	31.821	63.657	318.310	636.620			
2	1.886	2.920	4.303	6.965	9.925	22.326	31.598			
3	1.538	2.353	3.182	4.541	5.841	10.213	12.924			
4	1.533	2.132	2.776	3.747	4.604	7.173	8.610			
5	1.476	2.015	2.571	3.365	4.032	5.893	6.869			
6	1.440	1.943	2.447	3.143	3.707	5.208	5.959			
7	1.415	1.896	2.365	2.998	3.499	4.785	5.408			
8	1.397	1.860	2.306	2.896	3.355	4.501	5.041			
9	1.383	1.833	2.262	2.821	3.250	4.297	4.781			
10	1.372	1.812	2.228	2.764	3.169	4.144	4.587			
11	1.363	1.796	2.201	2.718	3.106	4.025	4.437			
12	1.356	1.782	2.179	2.681	3.055	3.930	4.318			
13	1.350	1.771	2.160	2.650	3.012	3.852	4.221			
14	1.345	1.761	2.145	2.624	2.977	3.787	4.140			
15	1.341	1.753	2.131	2.602	2.947	3.733	4.073			
16	1.337	1.746	2.120	2.583	2.921	3.686	4.015			
17	1.333	1.740	2.110	2.567	2.898	3.646	3.965			
18	1.330	1.734	2.101	2.552	2.878	3.610	3.922			
19	1.328	1.729	2.093	2.539	2.861	3.579	3.883			
20	1.325	1.725	2.086	2.528	2.845	3.552	3.850			
21	1.323	1.721	2.080	2.518	2.831	3.527	3.819			
22	1.321	1.717	2.074	2.508	2.819	3.505	3.792			
23	1.319	1.714	2.069	2.500	2.807	3.485	3.767			
24	1.318	1.711	2.064	2.492	2.797	3.467	3.745			
25	1.316	1.708	2.060	2.485	2.787	3.450	3.725			
26	1.315	1.706	2.056	2.479	2.779	3.435	3.707			
27	1.314	1.703	2.052	2.473	2.771	3.421	3.690			
28	1.313	1.701	2.048	2.467	2.763	3.408	3.674			
29	1.311	1.699	2.045	2.462	2.756	3.396	3.659			
30	1.310	1.697	2.042	2.457	2.750	3.385	3.646			
40	1.303	1.684	2.021	2.423	2.704	3.307	3.551			
60	1.296	1.671	2.000	2.390	2.660	3.232	3.460			
120	1.289	1.658	1.980	2.358	2.617	3.160	3.373			
∞	1.282	1.645	1.960	2.326	2.576	3.090	3.291			


v	α									
	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0190	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2969	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3529	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4698	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4908	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998

Source: Table A.1, Appendix A, Statistical Tables for Engineers and Scientists, 4th Edition, by Douglas C. Montgomery, John E. Myers, and Charles J. Vining, John Wiley & Sons, Inc., 1992.

Remarks: (answer the following questions... assume any missing data ... arrange your answer booklet ... Use blue, black pens or pencils... Be careful when filling the bubble sheet)

Question 1: Choose the correct answer in questions (1-30) and fill in the bubble sheet [30 points]

- 1- The critical angle inside an optical fiber is ...
 - A- $\sin^{-1}(n_{\text{core}}/n_{\text{cladding}})$
 - B- $\sin^{-1}(n_{\text{cladding}}/n_{\text{core}})$
 - C- $\sin^{-1}(1/n_{\text{core}})$
 - D- $\sin^{-1}(1/n_{\text{cladding}})$
- 2- The 8/125 optical fibers are suitable for...
 - A- Multi-mode transmission
 - B- Short distance transmission
 - C- Single mode transmission
 - D- Graded index profiles
- 3- The graded index multi-mode fibers will have a parabolic profile if $g = \dots$
 - A- 1
 - B- 2
 - C- 3
 - D- ∞
- 4- The ratio of number of propagating modes in a graded index fiber with $g = 4$ to the number of modes in a step index fiber is ...
 - A- 2/3
 - B- 1/3
 - C- 1
 - D- 3
- 5- The V parameter at cut-off wavelength for a graded index fiber is...
 - A- $2.405/\sqrt{1+(2/g)}$
 - B- 2.405
 - C- $2.405\sqrt{1+(2/g)}$
 - D- $2.405\sqrt{1+(2/g)}$
- 6- The loss in optical fibers occurs due to many factors except ...
 - A- Fiber material and impurity ions
 - B- Scattering.
 - C- Refractive index profile
 - D- bends
- 7- The linear scattering losses in optical fibers include ...
 - A- Rayleigh, Mie scattering
 - B- Brillouin, Raman scattering
 - C- Rayleigh, Raman scattering
 - D- Brillouin, Mie scattering
- 8- The non-linear scattering losses in optical fibers include ...
 - A- Rayleigh, Mie scattering
 - B- Brillouin, Raman scattering
 - C- Rayleigh, Raman scattering
 - D- Brillouin, Mie scattering
- 9- Modulation of the light by the thermal energy in the material of the optical fibers causes ...
 - A- Mie scattering
 - B- Rayleigh scattering
 - C- Raman scattering
 - D- Brillouin scattering
- 10- Critical bending radius does not depend on ...
 - A- Numerical aperture
 - B- Core refractive index
 - C- Core radius
 - D- Cladding refractive index
- 11- Dispersion in optical fibers can cause ...
 - A- Inter-symbol interference
 - B- Data-rate reduction
 - C- Neither (A) and (B) are correct
 - D- Both (A) and (B) are correct

- 12- Modal dispersion, Δt_{modal} , in step index multi-mode fibers is insensitive to ...
 - A- Number of modes
 - B- Numerical aperture
 - C- Core diameter
 - D- wavelength
- 13- At 850 nm wavelength, and in a single mode fiber, the waveguide dispersion is ...
 - A- Dominant
 - B- Greater than material dispersion
 - C- negligible
 - D- None of these answers are correct
- 14- Waveguide dispersion results from: the propagation constant of a mode being a function of ...
 - A- d/λ
 - B- λ^2
 - C- $1/\lambda^4$
 - D- None of these answers are correct
- 15- Total dispersion in an optical fiber can be calculated using...
 - A- $\sqrt{\tau_{\text{modal}}^2 + \tau_{\text{waveguide}}^2 + \tau_{\text{material}}^2}$
 - B- $\sqrt{\tau_{\text{modal}}^2 + \tau_{\text{waveguide}}^2 + \tau_{\text{material}}^2}$
 - C- $\sqrt{\tau_{\text{modal}}^2 + \tau_{\text{waveguide}}^2 - \tau_{\text{material}}^2}$
 - D- $\sqrt{\tau_{\text{modal}}^2 + \tau_{\text{waveguide}}^2 + \tau_{\text{material}}^2}$
- 16- V-groove alignment technique can be considered a (an) ...
 - A- Active alignment technique
 - B- Negative alignment technique
 - C- Passive alignment technique
 - D- Lossy alignment technique
- 17- Return loss in connectors can be reduced by ...
 - A- Active alignment techniques
 - B- Non-perpendicular cut for the facing ends of fibers
 - C- Passive alignment
 - D- Perpendicular cut for the facing ends of fibers
- 18- Various commercial optical fiber connector types can't include
 - A- FC connectors
 - B- SMA connectors
 - C- LC connectors
 - D- MC connectors
- 19- Fiber Bragg-grating can be used in ...
 - A- Chromatic dispersion compensation
 - B- Modal dispersion compensation
 - C- Star couplers
 - D- T-couplers
- 20- The problem in joining these two fiber ends shown in the figure is called:
 
 - A- Core diameter mismatch
 - B- Cladding diameter mismatch
 - C- Core centricity mismatch
 - D- Cladding centricity mismatch
- 21- modulation is done by superimposing the modulating (message) signal on the driving current.
 - A- Direct
 - B- Digital
 - C- Indirect
 - D- Analog
- 22- When the laser output wavelength drifts with modulating current, this phenomenon is called ...
 - A- intermodulation
 - B- clipping
 - C- Chirping
 - D- Drifting
- 23- The basic idea behind the construction of Mach-Zehnder modulator is ...
 - A- Refractive index profile can be changed by a magnetic field.
 - B- Refractive index can be changed by a magnetic field.
 - C- Refractive index profile can be changed by an electric field.
 - D- Refractive index can be changed by an electric field.
- 24- The shot noise in a photodiode is generated due to ...
 - A- Quantization of light energy into photons
 - B- The hole-electron pair generation
 - C- The multicolor in the incident light signal
 - D- Another answer

- 25- In photodiodes, the incident light is absorbed in ...
 A- The depletion region
 B- The p-type side
 C- The n-type side
 D- The entire photodiode
- 26- The reflection coefficient in a photodiode can be calculated as:
 A- $\frac{[(n+1)/(n-1)]^2}{(n-1)/(n+1)}$
 B- $\frac{(n-1)/(n+1)}{[(n+1)/(n-1)]^2}$
 C- The output current per photon
 D- Another definition
- 27- Quantum efficiency of a photodiode is defined as:
 A- The output current per incident optical signal
 B- The number of carriers generated per photon
 C- The output current per photon
 D- Another definition
- 28- The responsivity of a photodiode is defined as:
 A- The output current per incident optical signal
 B- The number of carriers generated per photon
 C- The output current per photon
 D- Another definition
- 29- The power absorbed in a photo diode =
 A- $P_i e^{-\alpha d} (1 + e^{-\alpha w}) (1 - R_f)$
 B- $P_i e^{-\alpha d} (1 - e^{-\alpha w}) (1 + R_f)$
 C- $P_i e^{-\alpha d} (1 - e^{-\alpha w}) (1 - R_f)$
 D- $P_i e^{-\alpha d} (1 - e^{-\alpha w}) (1 + R_f)$
- 30- An optical link can be restored from the effect of losses by ..
 A- Adding an optical amplifier
 B- Adding circulators
 C- Adding Bragg grating
 D- Another method

Question 2: Decide True or False for sentences (1-30) and fill-in the bubble sheet [30 points]

- Modal dispersion in graded index fibers can be a negative value.
- Modal dispersion can be reduced in single mode fibers by using a graded index profile.
- Waveguide dispersion is proportionally dependent on beam width.
- Fresnel reflections can be considered an intrinsic loss mechanism.
- Power distribution among propagating modes play a role in the extrinsic factors of loss.
- The losses due to axial misalignment of the fibers depend on the distribution of power in the modes.
- Biconical taper alignment techniques are common in fiber alignment in temporal fiber connections.
- A polarizing splitter works only for multi-mode optical fibers.
- A directional coupler is a nonreciprocal device that isolates one input from the other.
- Spontaneous emission can result in photons that have random wavelengths.
- LEDs are the preferred optical source for multimode graded index optical fiber-based systems.
- LDs can source light for single mode optical fibers only.
- LDs for the 850-nm region are fabricated using GaAs and AlGaAs.
- Surface-emitting LED (SLED) has a structure that resembles the Fabry-Perot LD.
- SLEDs operate efficiently for bit rates up to 250 megabits per second (Mb/s).
- SLEDs are ELED-based diodes designed to operate in the super luminescence mode.
- Coupling losses of several decibels can easily occur when coupling light from an LD to a fiber.
- The coupling efficiency depends on the type of fiber that is attached to the optical source.
- ELEDs may be used for both single mode and multimode optical fiber systems.
- Turn on delay and resonance frequency are the two major factors that limit the power coupled from the source to the optical fibers.
- Electro-absorption (EA) modulator is always reverse biased.

- 22- The photodiode is a pin structure is operated when it is reverse-biased.
- 23- A photodiode has a spectral cutoff wavelength.
- 24- Long photon wavelengths cause increased surface absorption in photodiodes.
- 25- The shot noise is always independent on the center frequency but the signal bandwidth.
- 26- The link budget of an optical communication system is independent on the photodetector sensitivity.
- 27- The dark current of a photodiode can cause shot noise.
- 28- Background current in a photodiode result from the interference with biasing current.
- 29- As the depth of the depletion region increases, the photodiode performance enhances.
- 30- As the width of the depletion region increases, the photodiode performance enhances.

Question 3: Answer the following questions in your booklet [20 points]

- a) Consider a 50/150 multimode fiber with $n_1 = 1.48$ and $\Delta = 1.48\%$. If the light wavelength $\lambda = 1330$ nm, Find:
 i. The critical radius of bending.
 ii. The exact modal dispersion in units of $ns \cdot km^{-1}$ for a step index multimode fiber.
 iii. The modal dispersion in units of $ns \cdot km^{-1}$ if this fiber is a graded index multimode fiber at g_{opt} , $g = 0.9 g_{opt}$.
 iv. If the fiber length is 30 km, what will the bandwidth for the fibers described in (ii), (iii).
- b) A photodiode detector receives an optical signal of 1330 nm wavelength, and outputs 90 μA when the incident light beam has 600 μW . ($h = 6.63 \times 10^{-34} J \cdot s$, $q = 1.6 \times 10^{-19} C$, $c = 3 \times 10^8 m/s$). Calculate: i- Responsivity. ii- Quantum efficiency.

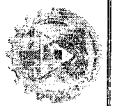
Question 4: Answer the following questions in your booklet [20 points]

- a) Consider the two fibers with the properties given in the table.
 i. Assume perfect alignment and calculate the splicing loss for the light in the two ways (from fiber 1 to fiber 2 and from fiber 2 to fiber 1).
 ii. If a joint between Fiber 1 and Fiber 1 suffers from lateral shift, $d = 5 \mu m$ and longitudinal shift, $s = 5 \mu m$, Calculate the loss.
 iii. What is the waveguide dispersion in fiber 2 in units of $ns \cdot km^{-1}$ if the source wavelength is 1330 nm and has line width 20 nm.
- | Parameter | Fiber 1 | Fiber 2 |
|-----------|---------|---------|
| n_1 | | |
| Δ | 1.45 % | 1.25 % |
| a | | |
| g | 2.0 | 1.0 |

[Use the empirical equation: $V \frac{d^2}{dV^2} (bV) = 0.08 + 0.549 (2.834 - V)^2$]

- b) A detector has responsivity of 0.4 A/W at 1330 nm and dark current of 0.9 nA. If the incident power is 150 μW and the system bandwidth is 60 MHz, find the rms shot noise current.
 $(h = 6.63 \times 10^{-34} J \cdot s, q = 1.6 \times 10^{-19} C, c = 3 \times 10^8 m/s)$

The end of questions
 Assoc. Prof. Sarrah A. Napoleon (Coordinator of the Course)
 Good luck

Course Title: Management and Marketing
Date: 01/02/2022
Course Code: EEC31H4
Allowed time: 2 hrs.Year: 3rd Year
No. of Pages: (4)**Remarks: (This question paper must be submitted with your answer form. Answer questions No.1 and No. 2 in the electronic answer form and question No.3 and No.4 in the answer notebook)****Question No. 1 : Choose the correct answer for all the following: (20) Marks**

- (1) Using historical cost data and statistical techniques to predict future costs is called
- a) parametric cost estimation
 - b) statistical cost estimation
 - c) prediction cost estimation
 - d) something else
- (2) ----- is the sum of all activities that take you to a sales outlet.
- a) Advertising
 - b) Management
 - c) Marketing
 - d) Promotions
- (3) All of the following are examples of **fixed** costs, except for
- a) rent
 - b) salaries
 - c) material
 - d) taxes
- (4) Specific objects to fill full our needs are -----.
- a) wants
 - b) demands
 - c) desires
 - d) none of these
- (5) The cost that does not involve a cash transaction but is reflected in the accounting system is called
- a) standard cost
 - b) indirect cost
 - c) book cost
 - d) sunk cost
- (6) "A customer wants the dealer to include some gifts with the goods ". This is an example of -----.
- a) unstated needs
 - b) delight needs
 - c) Real needs
 - d) unstated needs
- (7) The cost per unit of output established in advance of production or service delivery
- a) standard cost
 - b) indirect cost
 - c) cash cost
 - d) book cost

1/4

(8) There are ----- of ----- that can be marketed.

- a) five
 - b) four
 - c) seven
 - d) ten
- (9) All of the following are used as cost estimates techniques, except for
- a) indexes techniques
 - b) breakdown techniques
 - c) unit techniques
 - d) factor techniques
- (10) ----- is the most widely used technique in the advertisement world.
- a) Word-of-mouth
 - b) Branding
 - c) Events
 - d) Posters
- (11) The framework for defining all project work elements and their relationships is called
- a) cost and revenue framework
 - b) estimation framework
 - c) work breakdown structure
 - d) none of these
- (12) When the benefits of purchase are readily understood. The product is known as -----.
- a) fad product
 - b) low-learning product
 - c) high learning product
 - d) fashion product.
- (13) In order to get an estimate of "what should the product cost" you should use
- a) bottom-up approach
 - b) top-down approach
 - c) both (a) and (b)
 - d) neither (a) or (b)
- (14) ICBC bank and AXA insurance are examples of ----- needs.
- a) social
 - b) physiological
 - c) safety
 - d) esteem
- (15) Power sizing method depends on all the following except for
- a) plant size
 - b) plant cost
 - c) economy type
 - d) plant profit
- (16) After watching a good advertisement, reaction should be
- a) that's good
 - b) I like it
 - c) I will watch it again
 - d) I need it

2/4

(17) The breakeven point is the point at which the project

- a) makes loss
- b) makes profit
- c) makes neither loss nor profit
- d) something else

(18) --- is one of the reasons that make a customer become loyal to one brand over its competitors.

- a) Demands
- b) Camaraderie
- c) Empathy
- d) Social needs

(19) ... is used for reflecting increase of performance and efficiency with repetitive production.

- a) efficiency curve
- b) performance curve
- c) repetition curve
- d) learning curve

(20) Regular medical check-up is an example of ----- demand

- a) latent
- b) full
- c) negative
- d) unwholesome

Question No. 2 : Choose whether the following sentences are true or false: (10) Marks

(1) WBS structure includes only blocks related to physical work in the project

- a) True
- b) False

(2) With the development of the information technology, a lot of things have turned from the stage of needs to wants.

- a) True
- b) False

(3) It is important to understand the needs of the customer while it is not important to understand customer service psychology.

- a) True
- b) False

(4) Making a work plan for project staff is an engineering economic problem

- a) True
- b) False

(5) Strong impression means people recognise you by your name

- a) True
- b) False

(6) Emotional intelligence helps enhancing your communication strategy with customers.

- a) True
- b) False

(7) The production cost of first unit is the same as the cost of the tenth unit

a) True

b) False

(8) Companies estimate only how many people want their products irrespective of their willingness and ability to buy.

a) True

b) False

(9) There is only one breakeven point to determine profit region

a) True

b) False

(10) Power sizing method depends on economy type

a) True

b) False

Question No. 3 :

(5) Marks

A company produces an electronic timing switch that is used in consumer and commercial products. The fixed cost (C_F) is \$73,000 per month, and the variable cost (C_V) is \$83 per unit. The selling price per unit is $p = \$180 - 0.02(D)$, for this situation:

(a) determine the optimal volume for this product and confirm that a profit occurs (instead of a loss) at this demand.

(b) find the volumes at which breakeven occurs; that is, what is the range of profitable demand?

Question No. 4: Complete all the following sentences: (5) Marks

- a) Physiological needs in Maslow's hierarchy include ----- and -----.
- b) Being able to render excellent customer service creates -----.
- c) Customer loyalty, brand advocacy, and growing new opportunities are the essence of -----.
- d) ----- is to tell people that your product exists and educate them about its benefits.

<<Good Luck>>

Assoc. Prof. Mahmoud Selim (Course Coordinator)
Dr. Nancy Alshaer