

Question 1 (12 marks)

Circle the right answer directly on this sheet: True (T) and False (F)

An example of a conflict of interest is to work in a company and during holidays you work in your customer's company	T	F
A patent is defined as a legal protection for useful and non-obvious designs	T	F
A whistle blowing action is defined as to provide information internally (within the company) or externally (to the authority) about the company involvement in unknown activities	T	F
Legal protection for a name or symbol that is not commercially used is called trademark	T	F
Engineers shall acknowledge their errors without revealing the facts	T	F
Two engineers cannot write two books of the same topic because this is a copyright violation	T	F
The worldwide patent is better than the local patent	T	F
Engineers shall perform services only in the areas of their competence	T	F

Engineers use the knowledge of nature and natural processes to improve science.	T	F
Essential elements of professionalism are competence, integrity, responsibility, accountability and public obligation.	T	F
Engineering design is based on logical thinking and on systematic problem solving.	T	F
Development engineers set up the assembly line.	T	F
Engineering profession involves activities that require knowledge and skills not commonly possessed by the public.	T	F
Employers are looking for autonomous new graduates capable of carrying design projects individually.	T	F
Competence requires having relevant up-to-date skills appropriate to the exercised job.	T	F
Good understanding of engineering fundamentals and good communication skills are the two major things required by companies from professional engineers.	T	F

Question 2 (7 marks):

The following paragraph (presented in point format) is extracted from “Waterproof Cellular Phone Design” by Josh Salazar et al.

Read and answer the question below:

A.	With the explosion of the cell phone market in the last few years, there has been an increasing demand for a waterproof cell phone.
B.	<i>Recent research suggests that liquid related accidents or activities are responsible for more than 20 % of the cell phone damages.</i>
C.	Such frequent occurrence of fluid related accidents of cell phones raises the demand for a waterproof cell phone that is cost-effective and has normal cell phone capabilities.
D.	<i>Therefore, the market prospects of waterproof cell phones are positive.</i>
E.	The ultimate goal of this engineering project is to introduce a new, innovative, aesthetically pleasing, waterproof cell phone to the market that was both affordable and appealing to consumers.
F.	<i>Survivability without compromising the popular functions of current cell phone designs is essential to the success of this project and is kept in mind throughout the entire process.</i>
G.	By creating a phone capable of surviving the hazards of an everyday environment, consumers are afforded a luxury that is not currently available in the cell phone industry today, establishing a niche in the market for our product

Circle two letter that indicate best the right answer to the statements given in the table below:

1.	The problem to solve is defined through	A	B	C	D	E	F	G
2.	The problem statement of the project is defined through	A	B	C	D	E	F	G
3.	Special design requirements are defined through	A	B	C	D	E	F	G
4.	The main criteria used for the project are defined through	A	B	C	D	E	F	G
5.	The constraints set for the project are defined through	A	B	C	D	E	F	G
6.	The primary objective of the project is defined through	A	B	C	D	E	F	G
7.	The success of the project is proven by	A	B	C	D	E	F	G

Question 3 (5 marks)

The table below lists ten features that are considered in the design of an air plane seat to fulfill human requirements. Some of the listed features are

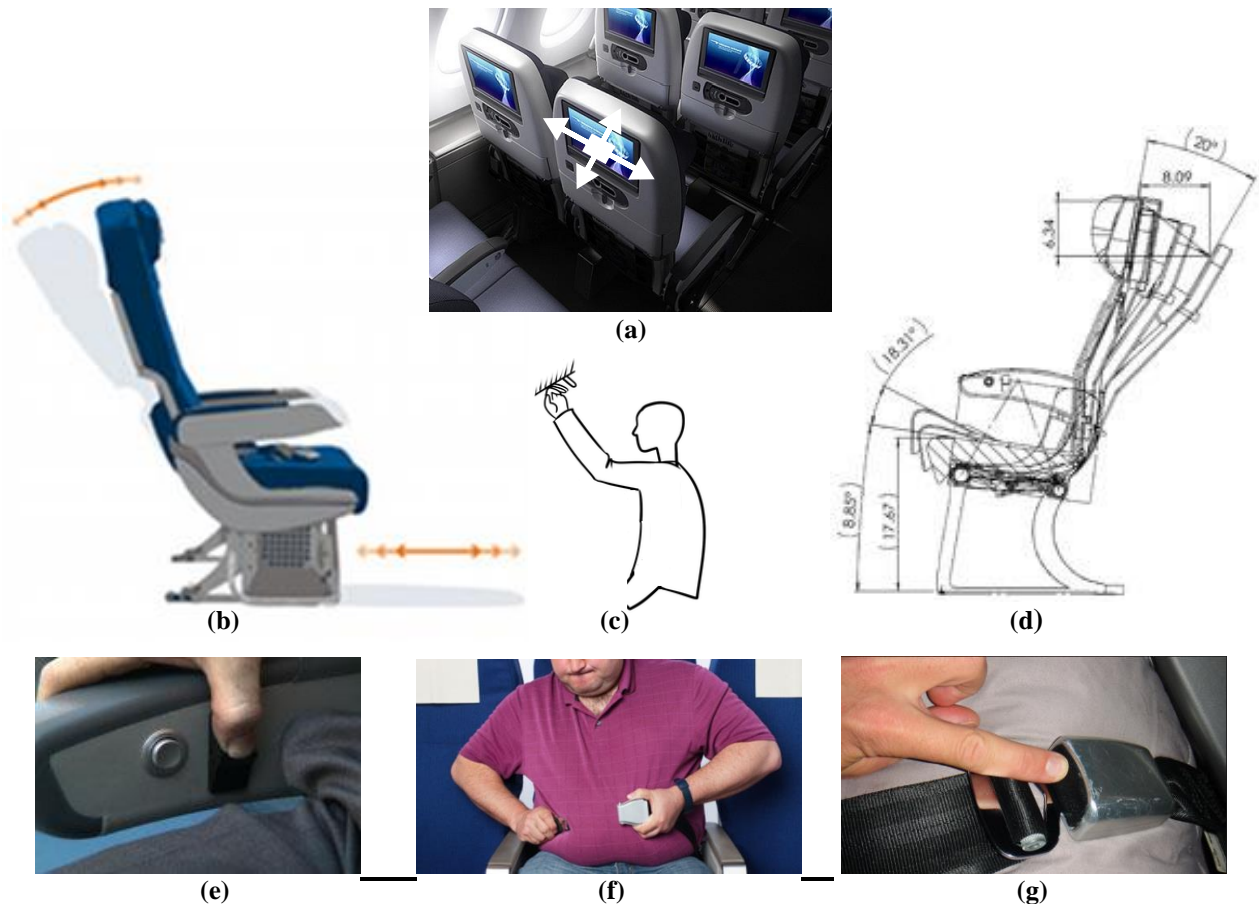


Figure 1: illustrations of human factors for airplane seat design

The symbols **A**, **B**, **C**, **D** indicate human factors as follows:

[A]: ANTHROPOMETRIC [B] ERGONOMIC [C]: PHYSIOLOGICAL [D]: PSYCHOLOGICAL

Circle one human factor symbol that is most related to each of the design features in the list

1	Inside air temperature		A	B	C	D
2	Force to adjust the seat	[figure 1- (e)]	A	B	C	D
3	Seat dimensions (Height, width)	[figure 1- (d)]	A	B	C	D
4	Force to control the air conditioning nozzle for the seat	[figure 1- (c)]	A	B	C	D
5	Seat headphones position		A	B	C	D
6	Seat light control position	[figure 1- (c)]	A	B	C	D
7	Dimensions of the entertainment screen	[figure 1- (a)]	A	B	C	D
8	Force to use the seat belt lock	[figure 1- (g)]	A	B	C	D
9	Seat belt length	[figure 1- (f)]	A	B	C	D
10	Room leg distance (distance between two seats)	[figure 1- (b)]	A	B	C	D

Question 4 (12 marks):

You have been asked to design a lamp for a studying table. Use the following functions (features) and options to answer the question given below:

- **Functions (Features):**

1	Power Supply	3	Size	5	Material
2	Bulb Type	4	Power Consumption		

- **Options**

1	Battery	9	Solar	17	120 W
2	Halogen	10	Medium	28	Small
3	Very Large	11	Standard	19	Oil/Petrol
4	5 W	12	Generator	20	Stone
5	Metal	13	100 W	21	Plastic
6	20 W	14	Glass	22	Electricity
7	Ceramic	15	Colored	23	Large
8	Fluorescent	16	Gas	24	Wood

- 1) Carry out a morphological analysis and obtain **THREE (3)** potential combinations by completing the table below.

FUNCTIONS	OPTION 1	OPTION 2	OPTION 3	OPTION 4	OPTION 5	OPTION 6
Power Supply						
Bulb Type						
Size						
Consumption						
Material						

- 2) Select from this analysis three potential concepts.

1.

2.

3.

3) Evaluate the **THREE (3)** combinations defined in part 2) using the weights and rates technique and determine the best design **considering the following:**

- Criteria:
 - (1) High quality studying environment (adequate illumination, preserving eyesight, eyestrain and fatigue)
 - (2) High economy (low electricity consumption)
 - (3) Low cost
 - (4) High safety
 - (5) High durability
- Equal weights (compromise)
- Rate 1 for worst and 10 for best

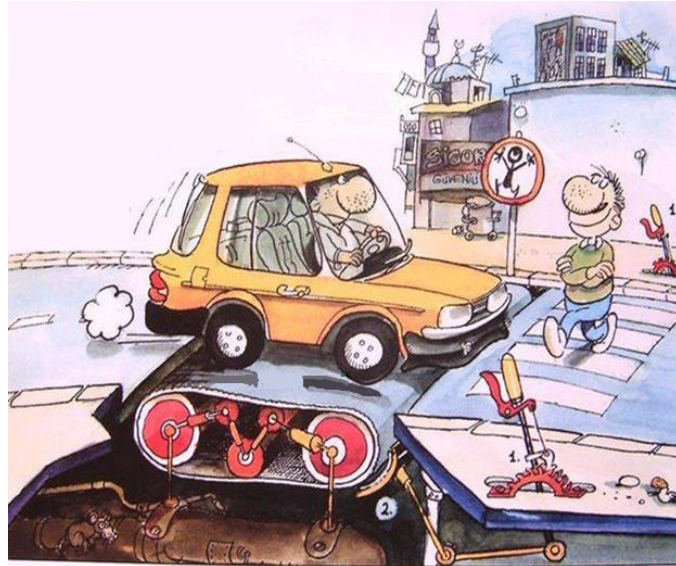
(Use the table below)

Criteria Concept		High quality studying environment	High economy	Low cost	High safety	High durability	Score
Weights	W	20%	20%	20%	20%	20%	100%
Design 1	R						480
	W*R						
Design 2	R						760
	W*R						
Design 3	R						940
	W*R						

Best Design:

Question 5 (6 marks)

The figure below shows an engineering design solution to a human need. The designed system **blocks temporarily** and **safely** vehicles to give pedestrians a chance to cross the street safely and peacefully. Considering that bridges and underground passages are not an option (not acceptable):



Sketch two simple different uncommon (not usual) alternatives that can replace the system shown in the figure.

Alternative 1

A large empty rectangular box with a blue border, intended for sketching an alternative traffic light system.

Alternative 2

A large empty rectangular box with a blue border, intended for sketching an alternative traffic light system.