

King Saud University

College of Engineering

GE 105: **Introduction to Engineering Design**

Quiz 3 Solution

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	Wood	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		

- a) 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	Battery	Solar	Generator	Gas	Oil/Petrol	Electricity
Bulb Type	Halogen	Fluorescent	Colored			
Size	Very Large	Large	Medium	Small		
Consumption	5 W	20 W	100W	120 W		
Material	Metal	Ceramic	Glass	Wood	Stone	Plastic

- b) Select from this analysis three potential concepts.

1. Battery > Halogen > Medium > 100 W > Plastic
2. Generator > Colored > Small > 5 W > Metal
3. Electricity > Fluorescent > Medium > 20 W > Ceramic

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

- Criteria:
 - (1) High quality studying environment (adequate illumination, preserving eyesight, eye strain 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

1. Battery > Halogen > Medium > 100 W > Plastic
2. Generator > Colored > Small > 5 W > Metal
3. Electricity > Fluorescent > Medium > 20 W > Ceramic

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	7	5	4	4	4	480
	W*R	140	100	80	80	80	
Design 2	R	3	10	10	7	8	760
	W*R	60	200	200	140	160	
Design 3	R	10	9	8	10	10	940
	W*R	200	180	160	200	200	

Best Design:

Best design is (3)

Electricity > Fluorescent > Medium > 20 W > Ceramic