

Birla Institute of Technology and Science Pilani, Pilani Campus

I SEMESTER 2023-24

Comprehensive Examination

Course No. & Name: MF F485 Sustainable Manufacturing

20 December 2023

Maximum Time: 3 hrs

Maximum Marks: 20

Note: Be succinct. No credit will be given for ambiguous answers.

Attempt all parts of a question in continuation

Q 1 You have already spent lot of time on the campus and are aware of transportation requirements. Develop a PSS based sustainable intra-campus transportation system(s) for the students and staff. Clearly define the role of various stakeholders and the opportunities available for these stakeholders. [4]

Q 2

- (i) Which is more sustainable – a disposable teacup or a reusable teacup? Assume suitable conditions for justification. [2]
- (ii) Discuss the importance of “Design for Disassembly” in sustainable manufacturing. [2]

Q 3

- i) Write the most suitable EoL option for the following materials. [2]
Pure metal, alloy, polymer, ceramics
- ii) Fossil energy resource is a major point of discussion at COP28 having influence on the India. Discuss how this can influence Indian economy, environment and society. [2]

Q 4 Figure 1 is a hierarchical model of barriers to sustainable manufacturing. Assume you are the secretary to government of India in the ministry of Industry. Develop a stepwise policy (objectives and corresponding activities) to mitigate these barriers so that Indian industry can adopt sustainable manufacturing effectively and easily. [4]

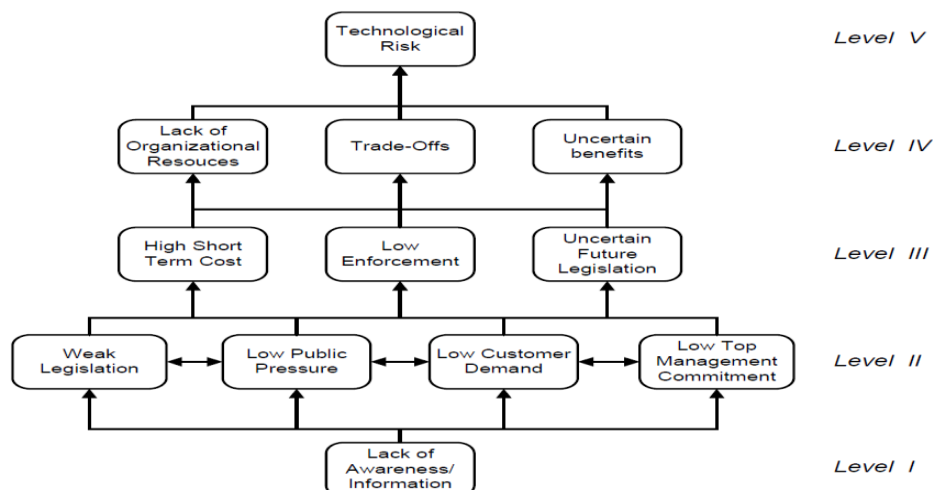


Figure 1

Q 5 The LCD monitor is made of different components and weighs about 4.0 kg in total, in which plastic housing, cables and some backlight assembly components weigh 0.53 kg, 0.23 kg and 0.02039 kg respectively. Find out following:

- i. The secondary recycling and landfill values of polycarbonate and PVC. (use table 1 and 2 for required data) [2]
- ii. Which EoL strategy is optimum for the polycarbonate material assuming equal weightage for end-of-life economic gains and environmental impacts? [2]

Table 1 Components of LCD monitor

S. No.	Component Name	Component material	Weight of component in Kg
1.	Plastic housing	Polycarbonate	0.53
2.	Steel	Low alloyed steel	2.5
3.	Printed wiring board	Silver, Gold, Palladium	0.052, 0.0196, 0.004
4.	Cables	Copper and PVC	0.16 and 0.17
5.	Color Filter Pigment	Chromium oxide, polyurethane resin	0.008, 0.0008
6.	Polarizer	TAC film, Polyvinyl alcohol	0.004, 0.002
7.	Liquid Crystal	Benzoic compound	0.0023
8.	Backlight Assembly	Yttrium, Mercury	0.164, 0.0399
9.	Alignment layer	Polyamide glass fiber	0.005

Table 2 three specific components

S. No.	Component	Material	Pricing	Cost in INR per kg	Environmental impact strategies	Environmental impact per kg of material in mPt
1.	Plastic housing	Polycarbonate	Market value	150	Primary recycling	-2.9
			Scrap value	90	Secondary recycling	-2.3
			Landfill	2	Landfill	0.9
2.	Cables	PVC	Market value	180	Primary recycling	-3.1
			Scrap value	100	Secondary recycling	-2.7
			Landfill	3	Landfill	0.8