NATIONAL INSTITUTE OF TECHNOLOGY ROURKELA
END- SEMESTER EXAMINATION, 2023
SESSION: 2022 – 23 (Spring)
B. Tech. 4th. Semester

Subject code: ID2202 | Subject Name: Materials and Process for Design | Dept. Code: ID
No. of pages: 01 | Full Marks: 50 | Duration: 3 Hrs.

Answer all the Questions

Q. No.	Particulars	Marks
1.	**a)** Explain the importance of thermal expansion coefficient and thermal conductivity while selecting various materials in product design.	[2]
	b) What are the different types of innovation through which a product evolves? Explain with examples.	[2]
	c) Schematically show various joint configurations that can be obtained by using Friction Stir Welding (FSW) technique.	[2]
	d) In a plasma arc welding process, the applied voltage and current are 22V and 200A respectively. If the arc heat transfer efficiency is 60% and the welding speed is 8 mm/sec., calculate the net heat input (J/mm) to the base material during the process.	[2]
	e) Schematically, show the ring rolling operation and highlight its application in various industries.	[2]
2.	**a)** Schematically, show the variation of loss coefficient and elastic modulus for metals, ceramics, polymers and natural materials. Explain, how these properties are affecting the material selection process for a particular industrial application.	[5]
	b) Explain the working principle of Metal Inert Gas (MIG) welding process and highlight its importance in industrial design.	[5]
3.	**a)** Highlight the working principle of soldering and brazing process. What is the major difference between these two processes and explain its importance in product design.	[5]
	b) Explain how compression molding process is used for producing body panels and bumpers for cars and trucks. Highlight its advantages over other molding operations.	[5]
4.	**a)** Explain which material and manufacturing processes you will choose to produce any of the product shown below (select any one product only). Explain the reason behind your material and process selection technique.  **Fig. 1 Exhaust fan**  **Fig. 2 Water storage tank**  **Fig. 3 Full face helmet**  **Fig. 4 Hard case trolley**	[7]
	b) Explain what is hot working and cold working in metal forming operations and highlight the advantages and limitation of these processes.	[3]
5.	**a)** Describe the importance of various extrusion techniques implemented in metal forming operation for producing extruded components.	[5]
	b) Explain the working principle and various applications of the screen printing and pad printing operation.	[5]

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