

Program: B. Sc. Engg. (IPE)
Semester: 6th

Date: 17 May 2023
Time: 10.00 am to 01.00 pm

ISLAMIC UNIVERSITY OF TECHNOLOGY (IUT)
ORGANISATION OF ISLAMIC COOPERATION (OIC)
DEPARTMENT OF MECHANICAL AND PRODUCTION ENGINEERING

Semester Final Examination
Course Number: IPE 4671
Course Title: Reverse Engineering

Summer Semester: 2021-2022
Full Marks: 150
Time: 3 Hours

Answer all the 6 (six) questions below. Marks distribution and CO-PO mapping are given in brackets.

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- Q1.** (a) Describe the importance of reverse engineering technique. Briefly discuss one application each of reverse engineering in the aerospace industries and human body treatment. [7+6] (CO1, PO1, PO5)
- (b) Provide three differences between contact and non-contact scanning methods. [3] (CO1, PO5)
- (c) Provide your opinions on the relationship between reverse engineering and rapid prototyping. Mention the advantages and disadvantages of rapid prototyping over general prototyping. [4+5] (CO1, PO1, PO5)
- Q2.** (a) Draw a common workflow of a rapid prototyping process and discuss the main stages of the process. [10] (CO2, PO1)
- (b) Describe the mechanism with a schematic diagram, advantages, disadvantages, and applications of the stereolithography additive manufacturing process. [15] (CO2, PO5)
- Q3.** (a) State the main operational principal of the powder bed fusion technique in additive manufacturing. Several 3d printing technologies have been developed based on the operational principal of this technique. Name some of the technologies and describe the working processes of any two technologies. [15] (CO2, PO5)
- (b) Briefly describe the use of rapid prototyping in different application fields. [10] (CO2, PO5)
- Q4.** (a) Design aspects and design considerations are important in part requirements for additive manufacturing (AM) process compliance. Describe (i) design aspects and design considerations with classified names of different features, (ii) the build time of an additively manufactured part, and (iii) the statement 'AM technologies produce parts with anisotropic mechanical properties' and the causes of such anisotropic behavior (draw necessary figure(s)). [6+4+5] (CO3, PO2)

- (b) Consider that you have an overhang of 12 mm in your desired 3d design. [5]
However, the printing technology that you are going to use offers 7 mm (CO3, PO3)
overhangs without any support. In this circumstance, you have altered the
aspect with an angled overhang. Now, the overhang becomes 9 mm. Draw the
decision-making flow chart for overhangs with this scenario provided and show
the final requirement to proceed the printing.
- (c) Suppose that you have to additively manufacture the following 3D model [5]
(Figure 1) with PLA material. Mention the possible strategies that can be taken (CO3, PO3)
to avoid the use of support structure.

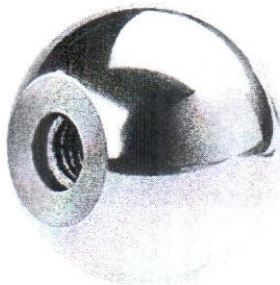


Figure 1 [Question 4(c)]

- Q5. (a) Determine the limitations of the STL file. Briefly describe the important [4+6]
settings that need to be considered when exporting STL files. (CO3, PO2,
PO3)
- (b) State the objectives of topology optimization and its influences on additive [6]
manufacturing. (CO3, PO2)
- (c) Discuss the post-processing phase of an additively manufactured part for [9]
surface texture improvements, aesthetic improvements, and property (CO3, PO3)
enhancements using thermal techniques.
- Q6. (a) Provide your explanation of the three main criteria that must be met for a patent. [5+4+5]
Mention four types of inventions, with necessary examples, that cannot be (CO4, PO6)
patented.
- (b) Write four advantages and four disadvantages of intellectual property rights. [8+3]
Briefly explain one example how intellectual property rights can limit the (CO4, PO5,
application of reverse engineering in automotive industries. PO6)
- (c) Discuss 'trade secrets'. [5]
(CO4, PO6)