Form A: *Ref. No.* **Ex/PG/LST/T/121A/2018**

Master of Laser Technology Examination, 2018
(2nd Semester)
SUBJECT: Laser Surface Modifiction & Forming Processes

Time: Three hours **Full Marks 100**

No. of questions	Use Separate Answer Scripts for Each PART	Marks
	Part I	
	Answer any ***two*** questions	
1. a)	Draw a neat sketch of a laser forming system, labeling its different components.	
b)	Discuss different mechanisms of laser forming process.	25
2. a)	Discuss the advantages of laser surface modification over other methods. What are the different objectives that you achieve, through different laser surface modification processes? How do you distinguish between laser surface cladding and laser surface alloying?	
b)	With the aid of a process map on a 'power density' versus 'interaction time' graph, compare the following surface modification processes: i) Shock hardening ii) Cladding iii) Laser chemical vapour deposition iv) Glazing Explain, how you calculate the interaction time in such cases.	25
3. a)	For surface modification with a moving laser beam, discuss how can you treat a workpiece as a thick plate or a thin plate, such that heat diffusion in it can be modeled as a three-dimensional or a two-dimensional phenomenon?	
b)	A metal plate, having a thickness h, is irradiated for surface hardening with a laser beam, delivering power q, while the workpiece moves at a speed of Ux. The thermal conductivity and the thermal diffusivity of the sheet material are k and α, respectively. Considering three-dimensional heating by the laser beam, find a solution for the temperature distribution within the workpiece.	25

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M.TECH. LASER SCIENCE AND TECHNOLOGY, 2018

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Use Separate Answer Scripts for Each PART

Part II

Answer any ***Five*** question

1.	Describe how the beam mode effects on the laser heat treatment	**10**
2.	Explain the Advantages and Disadvantages of Laser Surface Heat Treatment.	**10**
3.	Explain very briefly the micro-structural changes in steels during laser surface heat treatment	**10**
4. a)	Explain the Advantages and Disadvantages of Laser Cladding.	**7**
b)	Write short notes on: Full Annealing	**3**
5. a)	Explain Laser shock peening process with suitable diagram.	**8**
b)	Write short notes on: Dilution	**2**
6. a)	Compare the different mechanism for Laser Forming processes	**7**
b)	Write short notes on: Nitriding	**3**