Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code : 14ME4001** |  | **Duration :** | **3hrs** |
| **Sub. Name : FRICTION STIR WELDING AND PROCESSING**  **TECHNOLOGY** |  | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | With a neat flow chart, classify the welding and its allied processes. | CO1 | 10 |
| b. | **Draw a diagram to explain the construction and working principle of friction stir welding (FSW).** | CO1 | 10 |
| **(OR)** | | | | |
| 2. | a. | Draw rough sketches showing different methods to clamp a work piece on a FSW machine. List the merits and demerits of each fixture. | CO1 | 10 |
| b. | **With a neat sketch mention the nomenclature of a FSW tool.** | CO1 | 10 |
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| 3. | a. | **Sate the importance of D/d ratio and Static Volume/Swept Volume with respect to FSW. What are post-weld processes that are essential for FSW process?** | CO1 | 10 |
| b. | Draw the Macrostructure of a FS welded sample and mention various zones. Specify the significance of each zone. | CO1 | 10 |
| **(OR)** | | | | |
| 4. | a. | [Describe the correlation between friction stir processing, microstructure evolution and mechanical properties.](http://iopscience.iop.org/article/10.1088/1757-899X/230/1/012013) | CO1 | 10 |
| b. | Draw the forces vectors for FSW tool and determine an expression for the resultant force on the tool. | CO1 | 10 |
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| 5. | a. | What is meant by surface composite? Explain the procedure to fabricate it. List the applications, limitations and mertis of surface composites. | CO1 | 10 |
| b. | List various defects which occur in friction stir processing with  reasons. Mention the ways and means to eliminate such defects. | CO1 | 10 |
| **(OR)** | | | | |
| 6. |  | Derive a relationship between the forces acting on the friction stir welding tool and the temperature generation near the tool-work interface with respect to varying the process parameters. | CO1 | 20 |
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| 7. |  | Derive a mathematical model to interpret the increase in residual stress with respect to tool geometry. | CO1 | 20 |
| **(OR)** | | | | |
| 8. | a. | List the allied processes of FSW and explain Friction Surfacing in detail with a concept sketch. Enumerate its applications, merits and demerits. | CO1 | 10 |
| b. | Differentiate between static and dynamic recrystallisation. | CO1 | 10 |
|  | | **Compulsory:** |  |  |
| 9. |  | Compare Friction stir processing and Friction Surfacing. Estimate the effective process in developing surface composite with a case study. | CO1 | 20 |