

Mechanical Engineering Department  
MCL133- Near Net Shape Manufacturing  
Major, LHC111, 1.00 – 3.00 pm, Friday - 03/05/2019  
Max Marks 35

*Note: Be brief and specific in your answers. Neat sketches and drawings are necessary (wherever applicable). Make suitable assumptions, wherever required and state the assumptions made. Part A and Part B should be answered separately in two different answer sheets.*

**Part A**

- Q1. a) Give a schematic layout of continuous "Prepregs" manufacturing using *Thermoplastics*, how will it be different than the conventional process using *Thermosets*. (4)  
b) Give the cross sectional sketches of various cylindrical shapes that can be produced by filament winding as well as one cross section that can not be made by this technique. (3)  
c) In a pultrusion system, the temperature and viscosity of thermosetting resin keeps changing within the length of the die, illustrate graphically the fiber-resin temperature and viscosity as well as gel point position in 1.5 m long die of a C- section profile. (3)
- Q2. a) If no gate mark is allowed on the outside surface of a bottle cap having internal threads and no parting line is permitted on the threaded portion, can you visualize and draw the schematic layout of the injection mold for this near net shape product with core, cavity and ejection system for the mass production of 200 caps in 20 seconds. (4)  
b) Show with neat sketches how hesitation effects and under-flow of a polymer can be avoided in an injection molding (3)  
c) Differentiate between Sandwich molding of thermoplastics vs thermosets with one product example of each NNS technique. (3)

**Part B**

- Q3. a) List the problems and remedies associated with Magnesium Casting and explain near net shape (NNS) process for any one magnesium component (5)  
b) Explain the following in a casting processes i) Plastic pattern, ii) Stuccoing, iii) Cover gas and iv) Negative allowances. (4)  
c) Piston Ring (Fig a) and brake rotor disc (Fig b) are made up of grey cast iron. Comment on the shape of carbon (microstructural morphology) presence in these two components and comment on the amount of silicon in these two components, given carbon content (3.1wt %) for both the components (6)

