

Total No. of Questions : 8]

SEAT No. :

P4378

[Total No. of Pages : 2

[5462]-717

**M.E. (Production -Manufacturing & Automation)**  
**COMPUTATIONAL INTELLIGENCE IN TOOL DESIGN**  
**(2017 Pattern) (Semester - III)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any five questions.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right side indicate full marks.*
- 4) *Use of Calculator is allowed.*
- 5) *Assume Suitable data if necessary.*

- Q1)** a) Discuss applications of AI techniques to deal with various issues related to tool and die design? **[6]**  
b) What input data may be required for automated fixture design configuration? **[4]**

- Q2)** Formulate a mathematical model to determine the area of scrap ( $S$ ) in blank nesting operation considering variables as: pitch ( $p$ , mm) and blank orientation ( $\theta$ , degrees). **[10]**

- Q3)** Explain role of AI techniques for automated process planning in forging operation. **[10]**

- Q4)** Write short notes on : **[10]**  
a) Use of meta-heuristics to determine the optimum location and clamping system for fixture design.  
b) Techniques for Prediction of life of compound dies.

- Q5)** Calculate the amount of cooling water to be circulated for cooling the injection mold for the component having following data: Injection temperature of plastic =  $210^{\circ}\text{C}$ , temperature at the end of solidification =  $85^{\circ}\text{C}$ , Specific heat capacity of plastic  $3.72 \text{ KJ/Kg}^{\circ}\text{C}$ , weight of plastic component = 308 gm. Cycle time for component = 28 sec., Incoming water temperature  $208^{\circ}\text{C}$ , Outgoing water temperature :  $358^{\circ}\text{C}$ , Specific heat capacity of water :  $4.2 \text{ KJ/Kg}^{\circ}\text{C}$ . **[10]**

**P.T.O.**

**Q6) a)** Explain the factors to be considered while determining optimum number of cavities in die casting. How the optimum number of cavities can be calculated? [5]

b) Write note on : Computer aided die casting die design. [5]

**Q7)** Determine optimum level combination of Riser diameter ( $d$ ), pouring temperature ( $t$ ), and casting speed ( $v$ ) in case of sand casting process using Taguchi method to minimize the filling ( $T_f$ ). The effect of  $d$ ,  $t$ , and  $v$  (three levels each) on  $T_f$  for 9 experiments is shown in Table. [10]

Experiment Number	$d$ (mm)	$t$ (°C)	$v$ (cm/s)	$T_f$ (sec)
1	1	1	1	6.3
2	1	2	2	5.5
3	1	3	3	5.9
4	2	1	2	6.1
5	2	2	3	5.2
6	2	3	1	5.4
7	3	1	3	5.8
8	3	2	2	6.4
9	3	3	1	6.0

**Q8)** Write short notes : [10]

- Defect analysis in die casting.
- Product design for castability.

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