Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

(A constituent unit of MAHE, Manipal)

V SEMESTER B. TECH (IP ENGG.) END SEMESTER

MAKE UP EXAMINATIONS, DECEMBER 2018

SUBJECT: THEORY OF METAL FORMING [MME 4045]

REVISED CREDIT SYSTEM

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Missing data may be suitably assumed.
- Use of Design data hand book is permitted

1A.	Briefly comment on the temperature developed during metal forming processes.	**3**
1B.	Illustrate the behavior of a material in terms of its crystal lattice structure when subjected to elastic and plastic deformation loads.	**2**
1C.	A strip of metal is originally 2 m long. It is stretched in three steps. First, to a length of 2.25 m, then to 2.5 m and finally to 3.5 m. Show that, the true strains are addictive. Also show that using engineering strains, the strain for each step cannot be added to obtain total strain.	**3**
1D.	A metal has a flow curve with parameters, K = 700 MPa and n = 0.26. A tensile specimen of gage length 45 mm is stretched to a length of 85 mm. Determine the flow stress at this new length and the average flow stress.	**2**
2A.	Sketch and explain the various parts of die used in closed die forging.	**4**
2B.	Cold upset forging of a cylindrical billet of initial height 60 mm and initial diameter 30 mm, results in a final reduced height of 40 mm. The material of the billet has flow stress given by the expression: $Y = 300\varepsilon^{0.2}$ MPa. The coefficient of friction between the billet and die surfaces can be assumed to be 0.1. What is the forging force required at the reduced height?	**3**
2C.	Sketch and explain the working principle of a power hammer.	**3**
3A.	A 300 mm wide strip, 25 mm thick is fed through a rolling mill with two powered rolls each of radius = 250 mm. The work thickness is to be reduced to 22 mm in one pass at a roll speed of 50 rev/min. The work material has a flow curve defined by K = 275 MPa and n = 0.15, and the coefficient of friction between the rolls and the work	**3**

	is assumed to be 0.12. Determine if the friction is sufficient to permit the rolling operation to be accomplished. If so, calculate the roll force, torque and total power.	
3B.	Analyze the effect of insufficient roll camber in rolling process.	**4**
3C.	Does edging defect distribution varies with light reduction and heavy reduction during metal rolling process? If so how?	**3**
4A.	Illustrate how friction is a factor in determining the ram force in direct extrusion but not a factor in indirect extrusion.	**2**
4B.	Explain the working of a floating plug type tube drawing process.	**2**
4C.	For wire drawing, show that the drawing stress σ_d, in plane-strain drawing of a flat sheet is given by the expression, $$\sigma_d = \sigma_o^{'}\left(1+\frac{\tan\alpha}{\mu}\right)\left[1-\left(\frac{h_f}{h_o}\right)^{\mu\cot\alpha}\right]$$	**3**
4D.	Explain Ugine-Sejournet process used for hot extrusion of metals. Comment on how the ram speed influences the lubricant coating.	**3**
5A.	With a neat sketch explain the mechanics of shear spinning operation.	**3**
5B.	Comment on yield-point elongation, planar anisotropy and wrinkling considering sheet metal operations.	**3**
5C.	A batch of small cup shaped components has to be formed very quickly. Which of the HERF process can be utilized to form cup shaped components. Sketch and explain the stages of production.	**4**