Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

II SEMESTER M.TECH. (AUTOMOBILE ENGINEERING)

END SEMESTER EXAMINATIONS, APRIL/MAY2017

SUBJECT: DESIGN FOR MANUFACTURING AND SERVICEABILITY (AAE 5235)

(29/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ALL** the questions.
- Assume missing data suitably by clearly stating the assumption.

1A What are the various types of orientation tolerances in GD &T? Explain any two of them with an example. **(03)**

1B What are Rule 1 and Rule 2 of GD &T? Give an application example for them. **(03)**

1C With reference to **Figure 1**, indicate all the possible feature sizes of the hole, its bonus tolerance and total positional tolerance using a tabular column. What is the virtual condition dimension for this feature? All dimensions are in mm. **(04)**

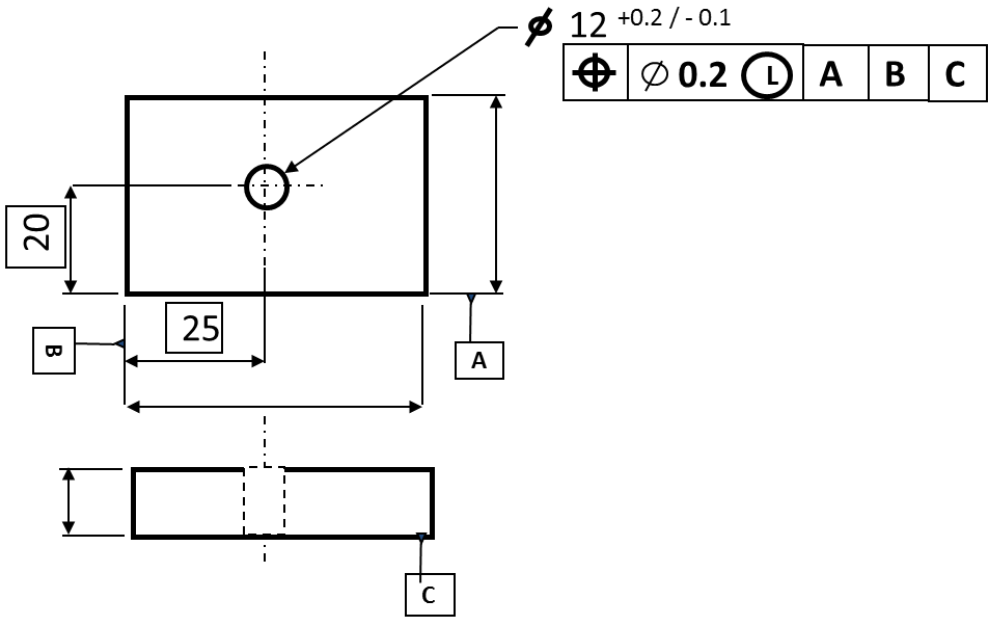

Figure 1

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2A State the roles of λ_s, λ_c and λ_f filters for the surface topography analyses. **(03)**

2B The data given below are a few sample values of fully processed height data of a machined surface profile measured by a roughness instrument using a cut-off of 0.8 mm. **(04)**

Sampling length 1 in µm: +2.4, +2.4,-2.5,-3.8,-1.2, +2.1
Sampling length 2 in µm: +2.2, +1.5, +1.6,-4.5,-3.8,-3.8
Sampling length 3 in µm: +3.8, +1.5, +1.6,-2.5,-2.8,-1.8
Sampling length 4 in µm: +1.5, +1.4,-1.9,-3.6,-3.2, +2.1
Sampling length 5 in µm: +3.2, +2.1, +2.8,-1.5,-3.1,-2.0

Based on the given data, compute the following roughness parameters as per the ISO definitions.

a) Rp b) Rt c) Rq d) Rz

2C What is the significance of Abbott's parameters Rpk ,Rvk and Mr_2 for engineering components used for tribological application? **(03)**

3A **Figure 2** represents vector loop tolerance stack-up diagram of an assembly. Perform the worst case tolerance analyses, draw tolerance table and compute the minimum gap in the assembly. **(04)**

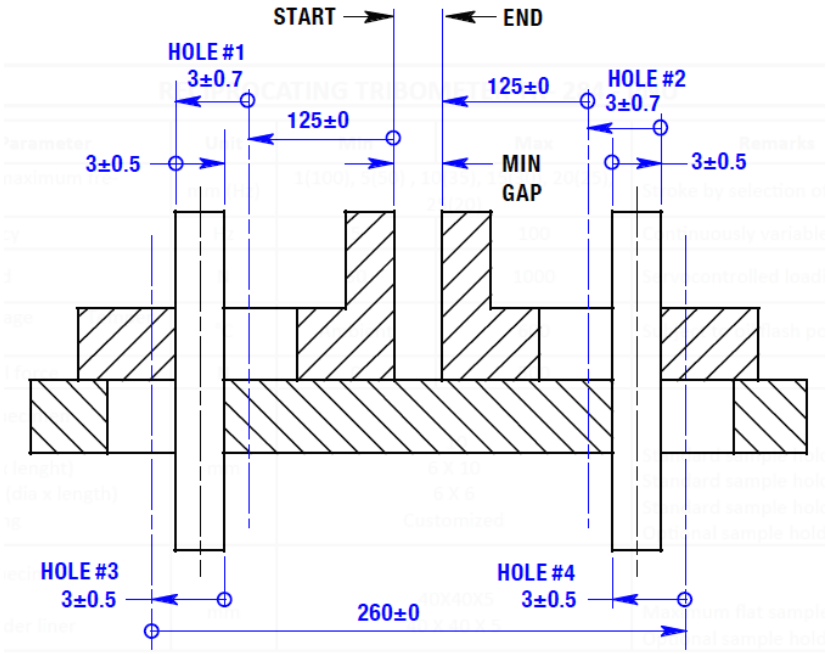

Figure 2

3B Perform the statistical RSS method based tolerance stack up analyses on the assembly shown in **Figure 3** and solve for minimum and the maximum gap between A and B. Draw the tolerance stack up sketch and tolerance table. What would be the minimum and maximum gap if modified RSS method is applied to this assembly? **(06)**

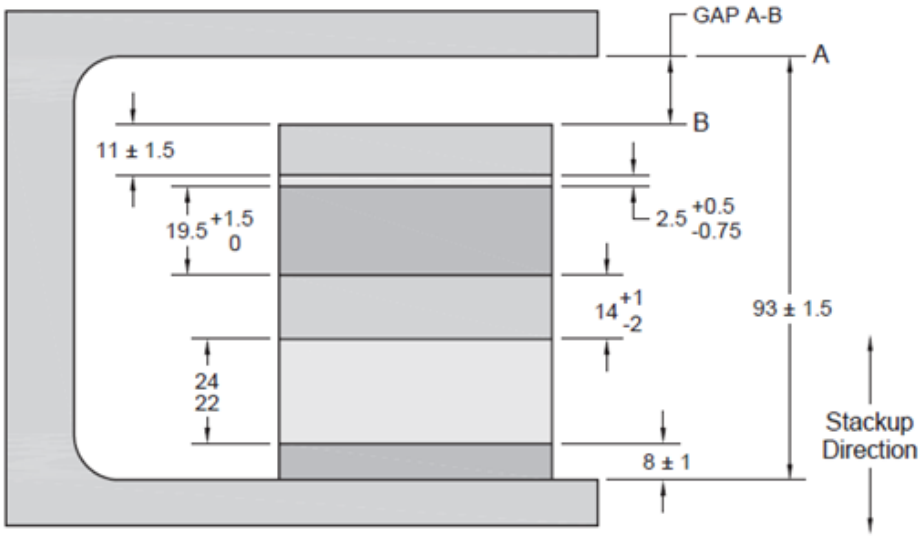

Figure 3

4A Explain the different steps involved in the systematic selection of manufacturing process for an application based on Ashby's charts? **(04)**

4B A material is required for the design of visor for a safety helmet to provide maximum facial protection. **(02)**

Visor for helmet

List functions and design limiting constraints for this case; set the objective to 'minimize material price' and the free variable to 'choice of material'.

4C Two materials are being considered for an application in which electrical conductivity is important. **(02)**

Material	Working Strength MN/m^2	Electrical Conductance %
A	500	50
B	1000	40

The weighting factor on strength is 3 and 10 for conductance. Which material is preferred based on the weighted property index analyses?

4D What is Material Performance Index? Explain the concept with an example. **(02)**

5A With the help of illustrative sketches, explain any five design for assembly guidelines. **(05)**

5B Explain any five design for manufacturability guidelines for casting, with the help of examples and sketches. **(05)**