(3 Hours) [Total Marks : 80]

N.B. **(1)** Question no. **1** is **compulsory.**
(2) Attempt any **three** questions out of remaining **five** questions.
(3) Illustrate your answer with **necessary** sketch wherever **necessary**.
(4) Figures to the **right** indicate full **marks**.
(5) Assume suitable data wherever **necessary**.

1. **Attempt any FOUR of the following :** **(20)**

(a) What is undercutting of gear teeth?
(b) Explain about closed loop systems in CNC machines.
(c) Explain the expression for shear plane angle in metal cutting.
(d) What is surface finish?
(e) Explain different types of milling cutters.

2. **(a)** What are the basic elements of drilling machine? Explain function of each. **(10)**
(b) Writes about GM codes in CNC machines. **(6)**
(c) Write about the maintenance of CNC machines. **(4)**

3. **(a)** While machining a mild steel rod on the lathe, following results were obtained: Width of cut = 2.5 mm, Uncut chip thickness = 0.27 mm, Chip thickness = 0.7 mm, Rake angle = 0 degree, Cutting force = 900 N, Thrust force = feed force = 450 N. Determine (i) Chip thickness ratio (ii) Chip reduction ratio (iii) Shear plane angle (iv) Coefficient of friction (v) Friction angle. **(10)**
(b) What is gear grinding? **(6)**
(c) Explain gear hobbing process of gear manufacturing. **(4)**

4. **(a)** State the requirement of dynamometer and explain any one mechanical dynamometer. **(10)**
(b) Explain machinability. **(6)**
(c) Write about tool angles in ASA (American Standards Association) system with neat sketch. **(4)**

5. **(a)** Describe HSS (High Speed Steel) tool. **(10)**
(b) Write about Single point cutting tool. **(6)**
(c) Describe various broach terms with neat sketch. Write the formula for the following elements- Total number of teeth in a broach, Effective length. **(4)**

6. Write short notes on: **(20)**
(a) Classification of shapers.
(b) Geometry of milling cutter.
(c) Nomenclature of drilling tool.
(d) Form tool.
(e) Factors affecting tool life.
