

QP Code : **NP-19785**

(3Hours)

[Total Marks :80

- N.B.:**— (1) Question no. 1 is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume suitable data if necessary.

1. Attempt any five of following:—
 - (a) Explain shaping machine with neat diagram.
 - (b) Differentiate between open loop and closed loop systems in CNC machines.
 - (c) Draw two dimensional tool dynamometer and explain its features.
 - (d) Show that in metal cutting $V_c = V \times r_c$
 - (e) Write a note on lubrication effects of cutting fluids.
 - (f) Explain orthogonal rake system in detail.

2. (a) Explain the design procedure for a broach tool with help of diagram. 10
(b) Write a note on cutting tool materials. 10

3. (a) With the help of neat sketch describe vertical machining centres. 10
(b) Derive an expression for optimum cutting speed and tool life for minimum cost and maximum production rate. Also show that optimum cutting speed for maximum production rate is always more than optimum cutting speed for minimum cost. 10

4. (a) In an orthogonal cutting setup, the depth of cut was 10 mm, feed = 1mm/Rev: cutting speed is 60 r.p.m. back rake angle = 10°, chip thickness ratio = 0.33, shear stress of material at zero compressive stress = 1000kg/sq.cm. Assume that value of constant 'K' in equation $2\phi + \beta - \alpha = \cot^{-1} k$, is 0.2. Calculate the resultant force, rate of metal removal. Shear strain, H.P at the tool per cubic cm of metal removal/ minute. 10
(b) Explain milling machines in detail. 10

5. (a) How is gear manufacturing done? Explain in detail. 10
(b) Derive the original Merchant's theory along with diagram and assumption. 10

6. Write short notes on:— 20
 - (a) Tool wear.
 - (b) Form tool design.
 - (c) G.M, codes in C.N.C. machines.
 - (d) Carbide tool inserts.