

- N.B.: (1) Question No.1 is compulsory.  
(2) Attempt any THREE questions out of remaining SIX questions.  
(3) Figure to the right indicate full marks.
1. A two stage nine speed gear box run by a 7.5 kw, 1440 rpm motor. The minimum and maximum output speeds are 150 and 1000 rpm respectively 20  
(a) Draw the structural diagram (b) Draw the optimum ray diagram  
(c) Draw the gearing diagram. Calculate the number of teeth on the gears; shaft sizes; centre distance between shafts and gear module.
2. (a) A screw press is to exert a force of 40kN. The unsupported length of screw is 40 CM. The nominal dia. of screw is 50 mm. The screw has square thread with pitch 10 mm. The material for screw and nut are medium carbon steel and C.I. 15  
For Steel : Crushing stress =  $320\text{N/mm}^2$ , Yield strength in =  $200\text{N/mm}^2$  and shear =  $120\text{N/mm}^2$ .  
For C.I. :  $T = 20\text{N/mm}^2$ ,  $E = \text{Steel} = 2.1 \times 10^5\text{N/mm}^2$ ,  $\sigma_{bs} = 12\text{N/mm}^2$ .  
Find factor of safety of screw against failure and total height of screw in contact with nut  
(b) Explain methods of wear compensation. 5
3. (a) Design a Journal bearing to support a load of 500 kgf at 600 rpm. A good 15 quantity of oil is supplied through oil rings. Oil is used and the material for bearing is bronze - Babbitt. Design share clearly indicate permissible heat generated and mean oil film thick. Take  $d/c = 1,000$ . 15  
(b) Explain acceptance test for machine tools. 5
4. (a) Design a plate clutch for use in a machine tool from the following data : 15  
Power to be transmitted : 8 kw, Speed : 1,000 rpm. Number of operations likely in 8 hour shift 80 to 100.  
Design the dimensions of the clutch plate you have designed. Clearly state the various assumptions made.  
(b) Draw a neat circuit diagram of a metering out flow control system of a hydraulic drive and explain its working principle. 5
5. (a) What is machine tool structure? Give the classification of machine tool structure. Enumerate the requirements of machine tool structures and explain how to meet these requirements. 7  
(b) What are major requirements of guideways ? 8  
(c) How bearing are classified? 5
6. Write Short Notes on (any Four) : 20  
(a) Norton gear box (b) Meander drive (c) Power pack in a hydraulic drive  
(d) Preloading of bearing (e) Hydrostatic and Hydrodynamic bearings.