(Pages : 3) **B – 5529**

Reg. No. : .....

Name : .....

Sixth Semester B.Tech. Degree Examination, March 2017
(2008 Scheme)
Branch : MECHANICAL ENGG.
08.605 : Design of Machine Elements – I

Time : 3 Hours Max. Marks : 100

Instructions : *1) Approved Design Data Hand book* ***permitted****.*
2) Assume missing data, if any ***suitably****.*
3) Answer ***all*** *questions from Part* ***A*** *and* ***one full*** *question from* ***each*** *Module, from Part* ***B****.*

PART – A

1. Explain with sketches about Fits and Tolerances.
2. Explain two theories of failure which are commonly used for ductile materials.
3. Define factor of safety. What are the factors which influence factor of safety ?
4. Explain true stress and true strain curve. How it differ from Engineering stress/ strain curve ?
5. Distinguish between pin, axle and shaft.
6. Explain different threaded fasteners and thread standards.
7. Sketch and discuss the various types of welded joints used in pressure vessels.
8. Explain the construction details of leaf springs.
9. Explain shrink fit stresses in built-up cylinders.
10. What is Wahl's factor and state its importance in the design of helical springs ?

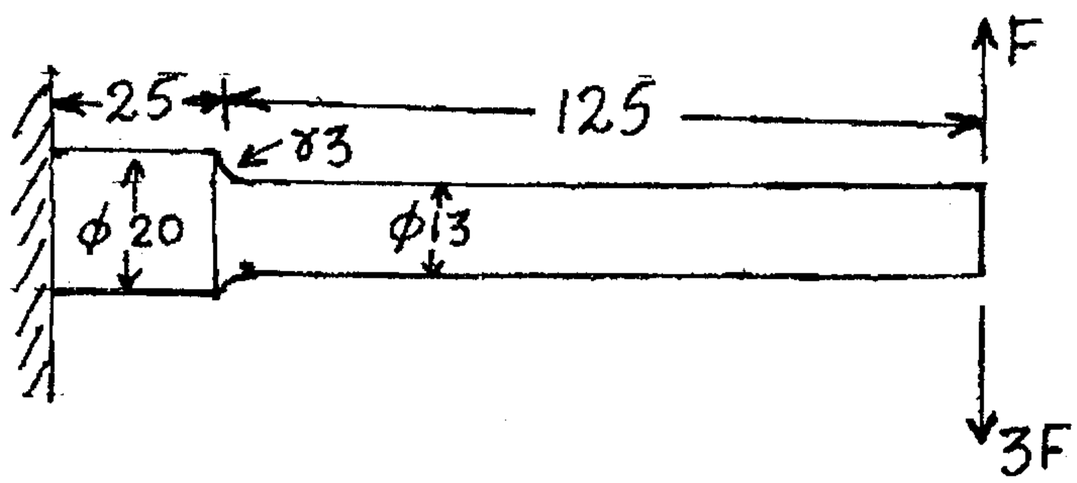
(10×4=40 Marks)

P.T.O.

PART – B

Module – I

11. A cantilever beam, made of cold drawn steel of circular cross section as shown in figure is subjected to a load which varies from –F to 3F. Determine the maximum load that this member can withstand for an indefinite life using a factor of safety N = 2. The notch sensitivity for a 3 mm radius for this material is 0.9. Analyse at the change of cross section only. $\sigma_u = 550\ MN/m^2$, $\sigma_y = 470\ MN/m^2$.

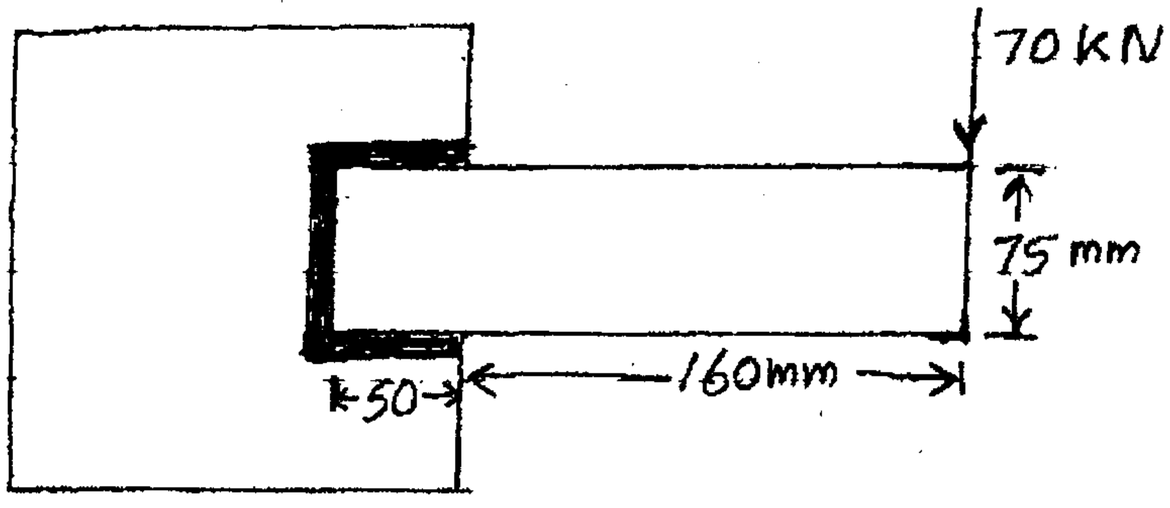


12. A mild steel shaft of 50 mm diameter is subjected to a bending moment of 2500 Nm and a torque of 'T'. If the yield point of steel in tension is 200 N/mm^2, find the maximum value of this torque without causing yielding of the shaft according to various theories of failure. Assume factor of safety as 1.2.

Module – II

13. Design a CI protected type of flange coupling to connect two shafts used to transmit 100 KW at 300 rpm. Take shear stress (Flange) = 15 MN/m^2 and overload capacity of 25%.

14. A rectangular steel plate is welded as a cantilever to a vertical column and supports a single concentrated load as shown in figure. Determine the weld size if shear stress in the same is not to exceed 140 MPa.



Module – III

15. a) A seamless cylinder with a storage capacity of 0.025 m^3 is subjected to an internal pressure of 9 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel ($\sigma_{ut} = 400\ N/mm^2$) and factor of safety 2.5, determine the dimensions of the cylinder. **7**

b) Calculate the dimensions of a helical spring for a spring loaded safety valve from the following data. Valve diameter is 65 mm. Max pressure when the valve blows off freely is 0.74 N/mm^2. Valve lift when pressure rises from 0.7 to 0.74 N/mm^2 is 3.5 mm. Maximum permissible stress is 500 N/mm^2 spring index is 6, $G = 0.85 \times 10^5\ N/mm^2$. **13**

16. A hollow shaft, 500 mm outside diameter and 300 mm inside diameter, is supported by two bearings 6 m apart. The shaft is driven by a flexible coupling at one end and drives a ship's propeller at 100 rpm. The maximum thrust on the propeller is 500 KN when the shaft is transmitting 6000 KW. The shaft weighs 60 KN. Determine the maximum shear stress in the shaft considering the weight of the shaft and the column effect. **(3×20=60 Marks)**
