BIME-025

DIPLOMA VIEP MECHANICAL ENGINEERING

Term-End Examination

June, 2014

BIME-025 : DESIGN OF MACHINE ELEMENTS

01004

Time : 2 Hours   *Maximum Marks : 70*

Note :   *Attempt **any seven** questions. All questions carry **equal** marks. Design data book and scientific calculator is allowed.*

1. Define factor of safety. What are salient points **10** for selecting proper factor of safety ?

2. With the help of neat sketch and example, describe **10** allowance and tolerance during manufacturing.

3. Describe in detail the Solderberg diagram and **10** terms used in it.

4. Determine the maximum stress induced in a **10** stepped shaft as shown in fig.1, taking stress concentration into account, when the shaft is subjected to tensile load of 12 kN.

Fig 1.
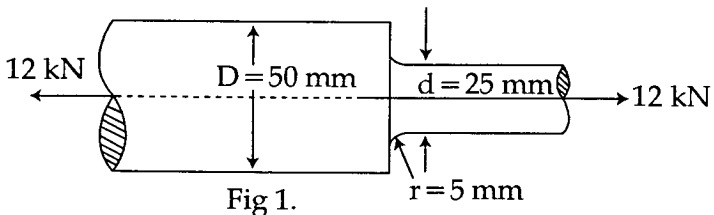
Take for $\dfrac{D}{d} = 2$ and $\dfrac{r}{d} = 0.2$, theoretical stress concentration factor $K_f = 1.64$

5. A steel spindle transmits 4 kW at 800 rpm. The **10** angular deflection should not exceed 0.25° per metre of spindle. If the modulus of rigidity for the material of the spindle is 84 GPa, determine the diameter of the spindle and the shear stress induced in the spindle.

6. Design the rectangular key for a shaft of 50 mm **10** diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa respectively.

7. With the help of neat sketch discuss : **10**
   (a) The failure of the knuckle pin in shear and
   (b) Failure of the forked end in crushing in knuckel joint

8. Determine the maximum shear stress and **10** deflection induced in a helical spring of the following specification, if it has to absorb 1200 N-m of energy. Mean diameter of spring = 100 mm, diameter of steel wire = 15 mm, number of coils = 40, modulus of rigidity of steel = 85 kN/mm^2. Find Wahl's stress factor.

9. Determine the diameter of piston rod for a **10** cylinder of 100 cm diameter subjected to pressure of 0.2 N/mm^2. The rod is made of alloy steel and is secured to the piston by tappered rod. The modulus of elasticity is 210 kN/mm^2 and F.O.S is 8. The length of rod may be assumed as 3 meters.

10. Write short notes on **any two** of the following : **10**
    (a) Stresses in ring
    (b) Concentric helical springs
    (c) Flange coupling
    (d) Limitations of Euler's formula