

DIPLOMA VIEP MECHANICAL ENGINEERING

Term-End Examination

December, 2013

BIME-025 : DESIGN OF MACHINE ELEMENTS

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. Write general procedure in machine design. 10
2. Define fits and classify it according to Indian standards. 10
3. Describe in detail the Goodman diagram and terms used in it. 10
4. Determine the maximum stress induced in a rectangular plate $60\text{mm} \times 10\text{mm}$ with a hole 12mm as shown in fig.1 subjected to a tensile load of 12kN , taking stress concentration into account. 10

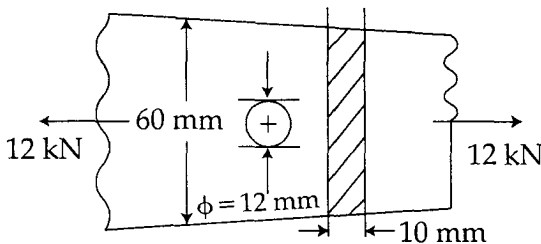


Fig. 1

[Use for $\frac{d}{b} = 0.2$, where d = diameter of hole and b is width of the plate, theoretical stress concentration factor as 2.5]

5. Two shafts have the same material and length. One is solid and another is hollow of same outside diameter. The hollow shaft has inner diameter half of outer diameter. Compare the weight, strength and stiffness with each other. 10
6. A 45mm diameter shaft is made of steel with a yield strength of 400 MPa. A parallel key of size 14mm wide and 9mm thick made of steel with a yield strength of 340 MPa is to be used. Determine the required length of the key, if the shaft is loaded to transmit the maximum permissible torque. Use maximum shear stress theory and assume a f.o.s as 2. 10
7. With the help of neat sketch, discuss 10
- (a) failure of spigot in tension across the weakest section (or slot) and
 - (b) failure of cotter in shear in socket and spigot cotter joint.
8. Determine the maximum shear stress and deflection induced in a helical spring of the following specifications if it has to absorb 1000N-m of energy. 10
- Take mean diameter of spring = 100mm, diameter of steel wire = 20mm, number of coils = 30, Modulus of rigidity of steel = 85 kN/mm² ; Use Wahl's stress factor.
9. Determine the diameter of piston rod for a cylinder of 125cm diameter subjected to pressure of 0.2 N/mm². The rod is made of alloy steel and is secured to the piston by tapered rod. The modulus of elasticity is 210kN/mm², f.o.s is 8 and length of the rod is 3 metres. 10

10. Write short notes on *any two* of the following : 10
- (a) Stresses in crane hook.
 - (b) Multi - leaf spring.
 - (c) Morgan's colour code.
 - (d) Equivalent length for various end conditions of column.
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