GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC SEM-III Examination-Dec-2011

Subject code: X31903   **Date: 17/12/2011**
Subject Name: Machine Design & Industrial Drafting
Time: 2.30 pm -5.00 pm
Total marks: 70

Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Define Machine Design and Explain various types of Machine Design.   **07**

(b) Define following terms: **07**
(i) Elasticity, (ii) Creep,
(iii) Fatigue, (iv) Tensile stress,
(v) Bearing stress, (vi) Hardness, (vii) Toughness.

Q.2 **(a)** Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and a factor of safety as 8. If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter when the ratio of inside to outside diameters is 0.5   **07**

(b) Design a knuckle joint for following stresses to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.   **07**
1. Failure of the solid rod in tension,
2. Failure of the knuckle pin in shear,
3. Failure of the single eye or rod end in crushing.
OR

(b) The pull in the tie rod of an iron roof truss is 50 kN. Design a Turnbuckle joint. The permissible stresses are 75 MPa in tension, 37.5 MPa in shear and 90 MPa in crushing.   **07**

Q.3 **(a)** Design the rectangular key for a shaft of 50 mm diameter. The shearing and crushing stresses for the key material are 42 MPa and 70 MPa   **07**

(b) Explain Oldham Coupling with the help of neat sketch.   **07**
OR
Q.3 **(a)** Explain various types of keys with neat sketch.   **07**

(b) Design a cast iron protective type flange coupling to transmit 15 kW at 900 rpm. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used :   **07**
Shear stress for shaft, bolt and key material = 40 MPa
Crushing stress for bolt and key= 80 MPa
Shear stress for cast iron= 8 MPa

Q.4 **(a)** What is Leverage? Discuss various types of levers and their practical application . 07

(b) A screw jack is to lift a load of 80 kN through a height of 400 mm. The elastic strength of screw material in tension and compression is 200 MPa and in shear 120 MPa. The material for nut is phosphor-bronze for which the elastic limit may be taken as 100 MPa in tension, 90 MPa in compression and 80 MPa in shear. The bearing pressure between the nut and the screw is not to exceed 18 N/mm2. Design a screw and a nut for this screw jack. 07

OR

Q.4 **(a)** A lever loaded safety valve is 70 mm in diameter and is to be designed for a boiler to blow-off at pressure of 1 N/mm^2 gauge. Design a suitable mild steel lever of rectangular cross-section using the following permissible stresses : Tensile stress= 70 MPa; Shear stress= 50 MPa; Bearing pressure intensity= 25 N/mm2. 07
The pin is also made of mild steel. The distance from the fulcrum to the weight of the lever is 880 mm and the distance between the fulcrum and pin connecting the valve spindle links to the lever is 80 mm.

(b) List various types of screw threads and explain them with the help of neat sketch. 07

Q.5 **(a)** Show by diagram the standard location of various elements of a welding symbol. 07
And also draw the symbols for following items.
(1)Welding all round, (2)Fillet welding,
 (3)Machining finish after welding (4) Projection welding

(b) A double riveted double cover butt joint in plates 20 mm thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are : σt = 120 MPa; τ= 100 MPa; σc = 150 MPa. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear. 07

OR

Q.5 **(a)** A 50 mm diameter solid shaft is welded to a vertical flat plate. The shaft is loaded eccentrically with 10 kN load at an eccentricity of 200 mm. If the size of the weld is 15 mm, find the maximum normal and shear stress in the weld. 07

(b) What is an eccentric riveted joint? Explain the design procedure adopted for designing such a joint? 07

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