



KERALA AGRICULTURAL UNIVERSITY
B.Tech.(Ag. Engg.) 2016 Admission
III Semester Final Examination-January-2018

Fpme.2104

Machine Design (2+0)

Marks: 50
Time: 2 hours

I Choose the most appropriate answer from the choices given below (10x1=10)

- 1 -----is the ability of the material to absorb energy when deformed elastically and release this energy when unloaded.
 - 2 The resistance to fatigue failure of a material is measured by its -----
 - 3 The most suitable theory of failure for ductile material is maximum ----- theory.
 - 4 Localization of high stresses due to geometrical irregularities or abrupt changes of the cross-section is called -----
 - 5 Transverse fillet welded joints are designed for-----strength.
 - 6 Pin of a knuckle joint is subjected to shear, -----and crushing stress.
 - 7 Bolts of a flange coupling are designed for -----strength.
 - 8 Spring constant is the ratio of applied force to-----
 - 9 In Lewis analysis gear tooth is considered as a-----
 - 10 Rolling contact bearings are also known as-----bearings.
- Choices:** a distortion energy b tensile c cantilever beam d resilience
e bending f stress concentration g endurance limit h shear
i anti friction j deflection

II Write Short notes on any FIVE of the following (5x2=10)

- 1 What is creep?
- 2 What is the difference between ductile and brittle materials?
- 3 Two plates of 12.5 mm thickness are to be welded together by means of parallel fillet welds. The plates are subjected to a load of 50 kN. Find the length of the weld so that the maximum shear stress does not exceed 56 MPa.
- 4 An eye bolt is to be used for lifting a load of 60 kN. Find the core diameter of the bolt, if the tensile stress is not to exceed 100 MPa.
- 5 A square key of 6 mm width is used for fixing a gear on 25 mm diameter shaft that transmits 200 Nm torque. Find the shear stress developed in the key if its length is 65 mm.
- 6 Radial load acting on a ball bearing is 5 kN and expected life for 90 % of the bearings is 696 million revolutions. Calculate the dynamic load carrying capacity of the bearing.
- 7 Maximum allowable tensile stress of a 5 mm thick and 140 mm wide leather belt, is 2.25 N/mm^2 . Find the maximum possible belt tension.

III Answer any FIVE of the following. (5x4=20)

- 1 Mild steel rod supports a tensile load of 50 kN. If the stress in the rod is limited to 100 MPa, find the size of the rod if its cross-section is a) circular b) square
- 2 A rectangular cross-section bar is welded to a support by means of fillet welds as shown in Fig.1. Determine the size of the welds, if the permissible shear stress in the weld is limited to 75 MPa.

PTO

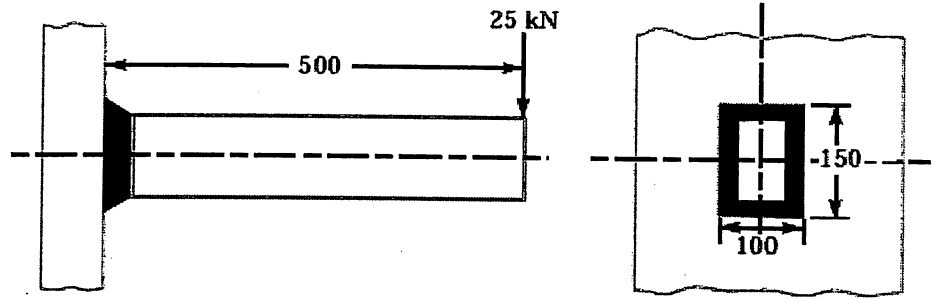


Figure 1 All dimensions are in mm

- 3 A steel plate subjected to a force of 5 kN and fixed to a channel by means of three identical bolts is shown in Fig.2. The bolts are made from plain carbon steel 45C8 (Yield Strength = 380 N/mm²) and factor of safety is 3. Specify the size of bolts.

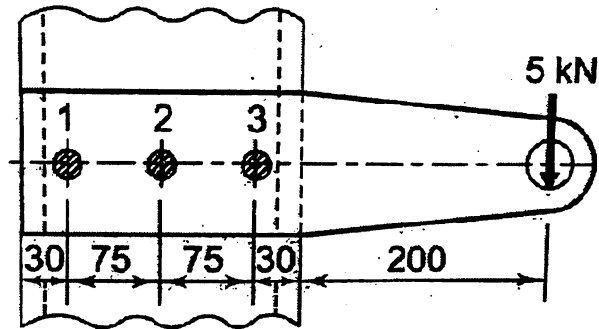


Figure 2 All dimensions are in mm.

- 4 Design a muff coupling to connect two shafts transmitting 40 kW at 120 rpm. The permissible shear and crushing stress for the shaft and key material (mild steel) are 30 MPa and 80 MPa respectively. The material of muff is cast iron with permissible shear stress of 15 MPa.
- 5 A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm², find the axial load which the spring can carry and the deflection per active turn.
- 6 A shaft made of mild steel is required to transmit 100 kW at 300 r.p.m. The supported length of the shaft is 3 m. It carries two pulleys each weighing 1500 N supported at a distance of 1 m from the ends respectively. Assuming allowable shear stress to be 60 MPa, determine the diameter of the shaft.
- 7 A cast iron pulley transmits 20 kW at 300 rpm. The diameter of pulley is 550 mm and has four straight arms of elliptical cross-section in which the major axis is twice the minor axis. Find the dimensions of the arm if the allowable bending stress is 15 MPa.

IV Answer any ONE of the following

(1x10=10)

- 1 Design a knuckle joint to connect two circular rods subjected to an axial tensile force of 50 kN.
- 2 The shaft of an overhang crank subjected to a force P of 1 kN is shown in Fig.3. The shaft is made of plain carbon steel 45C8 and the tensile yield strength is 380 N/mm². Determine the diameter of the shaft using maximum shear stress theory, considering a factor of safety of 2.

PTO

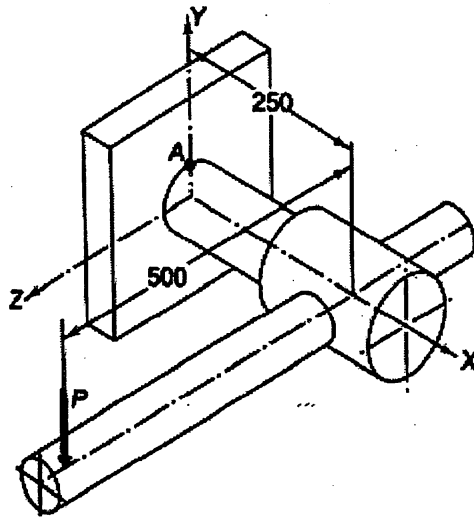


Figure 3 All dimensions are in mm.
