

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV(NEW) – EXAMINATION – SUMMER 2019

Subject Code:2142506

Date:20/05/2019

Subject Name: Fundamentals of Machine Design

Time:02:30 PM TO 05:00 PM

Total Marks: 70

Instructions:

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

		MARKS
Q.1	(a) Define machine design and give importants of the subject.	03
	(b) Draw plan and elevation of double riveted double strap butt joint with chain riveting.	04
	(c) Explain stress concentration and methods of reducing it.	07
Q.2	(a) Give different forms of screw threads with neat sketch.	03
	(b) Discuss common types of screw fastening with neat sketch.	04
	(c) A 50mm diameter solid shaft is welded to a flat plate as shown in figure 2(c), if size of weld is 15mm; find the maximum normal and shear stress in weld.	07

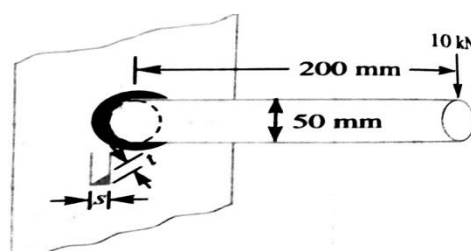


Fig. 2(c)

OR

- (c) A welded joint as shown in figure 2.1(c), is subjected to eccentric load of 2kN, find the size of weld, if the maximum shear stress in the weld is 25Mpa. 07

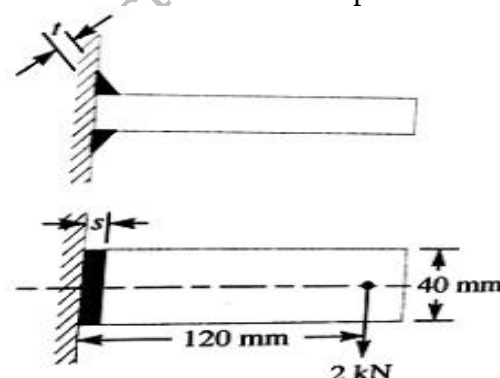


Fig. 2.1(c)

Q.3	(a) Compare shaft, axle and spline	03
	(b) Explain different locking devices.	04
	(c) Design a knuckle joint to transmit 150kN. The design stress may be taken as 75MPa in tension, 60MPa in shear and 150MPa in compression.	07

OR

Q.3	(a) List out different types of shaft coupling.	03
	(b) Discuss various modes of failure of riveted joint.	04

- (c) Design a cotter joint to support a load 30 kN in compression and 30kN in tension. The material used is carbon steel for which the allowable stresses are $\sigma_t = 50\text{MPa}$; $\tau = 35\text{MPa}$; $\sigma_c = 90\text{MPa}$. 07
- Q.4 (a)** Define following terms. 03
1) Strut 2) Crushing load 3) Buckling load.
- (b)** Give the function and purpose of coupling. 04
- (c)** Find a diameter of solid steel shaft to transmit 20kW at 200r.p.m. the ultimate shear stress for the steel may be taken as 360 MPa, and the 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 diameter is 0.5. 07

OR

- Q.4 (a)** Define following terms. 03
1) Slenderness ratio 2) Long column 3) Short column
- (b)** Explain different types of sunk keys with neat sketch. 04
- (c)** A shaft made up of mild steel is required to transmit 100kW at 300r.p.m. the supported length of the shaft is 3m. It carries two pulleys each weighs 1500N supported at a distance of 1m from the ends respectively. Take safe value of stress $\tau = 60\text{N/mm}^2$, determine the diameter of shaft. 07
- Q.5 (a)** List out different elements of the production drawing 03
- (b)** Give Euler's column theory and its assumptions. 04
- (c)** Give general procedure in design of a lever. 07

OR

- Q.5 (a)** Define surface roughness and how it is indicated on a drawing. 03
- (b)** Draw different types of end conditions of column. 04
- (c)** A handle for a turning a spindle of a large valve is shown in fig 5(c). The length of the handle from the center of the spindle is 450 mm. the handle is attached to the spindle by means of round tapered pin. If an effort of 400 N is applied at the end of the handle find 1) mean diameter of the tapered pin and 2) diameter of the handle. Take $\sigma_t = 100\text{MPa}$ in tension; $\tau = 55\text{MPa}$ in shear; assume that effort acts at a distance 100 from the end of the handle. 07

