

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER- IV (New) EXAMINATION – WINTER 2019

Subject Code: 2141907

Date: 14/12/2019

Subject Name: Machine Design & Industrial Drafting

Time: 10:30 AM TO 01:00 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) Explain Hole basis system and Shaft basis system.	03
	(b) Explain selection and use of theories of failure.	04
	(c) Explain types of fit with suitable examples.	07
Q.2	(a) Compare compressive stress and crushing stress.	03
	(b) Describe factor of safety.	04
	(c) Design a spigot and socket type cotter joint to connect two similar rods subjected to 75 kN axial loads in both the direction. For the rod as well as cotter material, shear stress is equal to 80 % of tensile stress. Tensile stress and crushing stress are 50 N/mm ² and 100 N/mm ² respectively. Determine (1) Diameter of rod (2) Diameter of spigot (3) Diameter of socket sleeve.	07
	OR	
	(c) A bell crank lever is to be designed to lift the load of 10 kN acting at the end of short arm of the lever. The length of short arm and long arm is 500 mm and 750 mm respectively. Allowable shear stress and tensile stress for lever and pin materials is 60 N/mm ² and 80 N/mm ² respectively. Allowable bearing pressure for pin material is 8 N/mm ² . For pin L/D=1.25. And for the rectangular cross section of the lever, ratio of height to width is 3. Determine: (1) dimension of the fulcrum pin (2) Dimension of lever.	07
Q.3	(a) Explain different types of supports.	03
	(b) Define: (1) Pitch (2) Lead (3) Nominal diameter (4) Core diameter for Power screw.	04
	(c) A 400 mm long alloy steel rod is used to support an axial compressive load of 65 kN. One end of rod is fixed and other end is free to support load. Assuming compressive yield strength 550 N/mm ² and modulus of elasticity 210 GPa. Calculate diameter of rod by buckling consideration. Use Rankin's formula with Rankin's constant $\alpha = 1/7500$ and factor of safety is 3.5.	07
	OR	
Q.3	(a) Explain different end condition of column.	03
	(b) Define: (1) Pitch (2) Back Pitch (3) Diagonal Pitch (4) Margin for Riveted joint.	04
	(c) An I section 500 mm × 250 mm × 10 mm and 10 m	07

long is used as a column. Both the ends of column are fixed. Take young's modulus $E = 200 \text{ GPa}$. Calculate Euler's critical load.

- Q.4**
- (a) Compare between shaft, axle and spindle. **03**
 - (b) List types of key with neat figure. **04**
 - (c) A muff coupling is used to connect two shafts rotating at 300 rpm and transmitting 55 hp. Calculate: (1) Shaft diameter (2) Outside diameter of sleeve (3) Design of key. Assume permissible shear stress for shaft and key as 42 N/mm^2 and for cast iron sleeve as 15 N/mm^2 . **07**

OR

- Q.4**
- (a) Classify coupling. **03**
 - (b) Define : (1) Shaft (2) Key (3) Coupling (4) Axle **04**
 - (c) Calculate the power transmission capacity of a muff coupling having shaft diameter of 80 mm, muff diameter of 150 mm rotating at 150 rpm. Permissible shear stress for shaft and muff are 50 N/mm^2 and 10 N/mm^2 respectively. **07**

- Q.5**
- (a) Illustrate surface roughness symbol and direction of lay and their symbol. **03**
 - (b) For single riveted lap joint, the plate thickness is 12 mm and the pitch of the joint is 70 mm. Determine rivet diameter, tearing, shearing, and crushing efficiencies of the joint. **04**
 Take Shear stress = 60 N/mm^2 , Crushing stress = 100 N/mm^2 , Tensile stress = 80 N/mm^2 .
 - (c) Analyze the force analysis for square threaded power screw. **07**

OR

- Q.5**
- (a) Illustrate flatness, straightness and circularity with symbol. **03**
 - (b) A circular shaft, 80 mm in diameter is welded to support by means of a circumferential fillet weld. It is subjected to a torsion moment of 3000 N-m. Determine the size of weld, if the maximum shear stress in the weld is not to exceed 70 N/mm^2 . **04**
 - (c) Analyze different stresses during design of screw and nut. **07**
