Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–IV (NEW) EXAMINATION – SUMMER 2024

Subject Code:2141907 Date:03-07-2024

Subject Name:Machine Design & Industrial Drafting

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

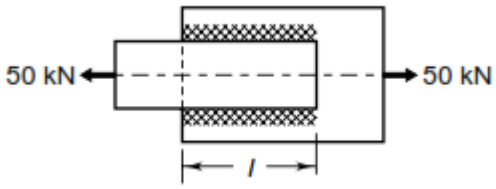
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Write the differences among Gradual, impact and fatigue loadings with examples.	**03**
	(b)	What are the various factors affecting the factor of safety.	**04**
	(c)	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 tensile, shear and compressive stresses are respectively 120 Mpa,100 Mpa and 150 Mpa. Find the efficiency of joint, taking the strength of the rivet in double shear as twice than that of single shear.	**07**
Q.2	**(a)**	Explain design procedure of Spigot and Socket joint.	**03**
	(b)	What is self-locking and overhauling of power screw? Explain the condition for self-locking.	**04**
	(c)	Design a knuckle joint for a tie rod of a circular section to sustain a maximum pull of 70 kN. The ultimate strength of the material of the rod against tearing is 420 MPa. The ultimate tensile and shearing strength of the pin material are 510 MPa and 396 MPa respectively. Determine the tie rod section and pin section. Take factor of safety = 6.	**07**
		OR	
	(c)	Enlist various theories of failure. Explain any two of them in detail with equations.	**07**
Q.3	**(a)**	Write a difference between shaft, spindle and axle	**03**
	(b)	What is key? What are the different types of key?	**04**
	(c)	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 metres. It carries two pulleys each weighing 1500 N supported at a distance of 1 metre from the ends respectively. Assuming the safe value of stress, determine the diameter of the shaft.	**07**
		OR	
Q.3	**(a)**	Discuss the function of a coupling. Give at least three practical applications.	**03**
	(b)	What are flexible couplings and what are their applications.	**04**
	(c)	Design a clamp coupling to transmit 30 kW at 100 r.p.m. The allowable shear stress for the shaft and key is 40 MPa and the number of bolts connecting the two halves are six. The permissible tensile stress for the bolts is 70 MPa. The coefficient of friction between the muff and the shaft surface may be taken as 0.3.	**07**

Q.4 **(a)** Give symbols for flatness, cylindricity, symmetry and straightness **03**

(b) Explain hole basis system and shaft basis system. **04**

(c) A steel plate, 100 mm wide and 10 mm thick, is welded to another steel plate by means of double parallel fillet welds as shown in Fig. The plates are subjected to a static tensile force of 50 kN. Determine the required length of the welds if the permissible shear stress in the weld is 94 N/mm$^{2.}$ **07**



OR

Q.4 **(a)** Explain surface roughness symbol. **03**

(b) Which are various types of fits? Explain their use in different condition **04**

(c) Derive the expression for torque require to lift a load 'W' using screw jack with a neat sketch. **07**

Q.5 **(a)** Briefly explain the general procedure for bell crank lever. **03**

(b) Differentiate between beam and column. **04**

(c) The maximum load on a petrol engine push rod 300 mm long is 1400 N. It is hollow having the outer diameter 1.25 times the inner diameter. Spherical seated bearings are used for the push rod. The modulus of elasticity for the material of the push rod is 210 kN/mm^2. Find a suitable size for the push rod, taking a factor of safety of 2.5. **07**

OR

Q.5 **(a)** Explain with neat sketch three basic types of lever stating their practical examples. **03**

(b) Why an I-Section is usually preferred to a round section in case of connecting rods? **04**

(c) What is equivalent length of a column? Write the relations between equivalent length and actual length of a column for various end conditions. Explain Euler's and Johnson's formulae giving equations. **07**

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