GUJARAT TECHNOLOGICAL UNIVERSITY
BE- SEMESTER–IV (NEW) EXAMINATION – WINTER 2024

Subject Code:2141907 **Date:27-11-2024**

Subject Name:Machine Design & Industrial Drafting

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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Differentiate between shaft and axle.	**03**
	(b)	Describe factor of safety.	**04**
	(c)	Explain different types of fit with neat sketches.	**07**
Q.2	**(a)**	Differentiate between beam and column.	**03**
	(b)	Define the following terms: (1) Tensile stress (2) Strain (3) Bending stress (4) Crushing stress	**04**
	(c)	Derive Rankine's Formula for buckling of column.	**07**

OR

	(c)	Design a knuckle joint to connect two mild steel bars under a tensile load of 25 kN. The allowable stresses are 65 MPa in tension, 50 MPa in shear and 83 MPa in crushing. Standard diameter of solid bars are 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40 mm. Check failure of knuckle pin in shear, failure of rod end and forked end in tension, shearing and crushing.	**07**
Q.3	**(a)**	Explain assumptions for Euler's Formula.	**03**
	(b)	Define Beam. Discuss types of support/end condition used in beams.	**04**
	(c)	Explain flange coupling with neat sketch.	**07**

OR

Q.3	**(a)**	Discuss the bolts of uniform strength.	**03**
	(b)	Explain hole basis system and shaft basis system.	**04**
	(c)	Design a protective type cast iron flange coupling for a shaft transmitting 15 kW power at a speed of 720 rpm. The permissible stresses are: For the shafts, keys and bolts material, Permissible tensile stress = 133.33 MPa Permissible compressive stress = 200 MPa Permissible shear stress = 66.67 MPa For flanges material, Permissible shear stress = 16.67 MPa The keys have square cross section.	**07**
Q.4	**(a)**	Define: (1) Pitch (2) Lead (3) Lead angle for Power screw.	**03**
	(b)	Find the diameter of a solid shaft to transmit 20 kW at 200 r.p.m. The ultimate shear stress for the steel may be taken as 360 MPa and factor of safety as 8.	**04**

If a hollow shaft is to be used in place of the solid shaft, find the inside and outside diameter considering the ratio of inside to outside diameters as 0.5

(c) With the help of neat sketch, explain design for square threaded power screw. **07**

OR

Q.4 **(a)** Define (1) Key (2) Coupling (3) Keyway **03**

(b) Explain different types of keys used in shaft coupling. **04**

(c) A double riveted double cover butt joint in plates 10 mm thick with 12 mm diameter rivets at 48 mm pitch. The permissible stresses for rivets and plates are: 120 MPa, 60 MPa and 80 MPa in tension, shear and compression. Determine the efficiency of joint. **07**

Q.5 **(a)** What is stress concentration and discuss the method to relieve stress concentration. **03**

(b) What are the causes of residual stresses in welded joint? How are they relieved? **04**

(c) Derive the expression for torque required to raise the load by square threaded screw. **07**

OR

Q.5 **(a)** Draw symbols for flatness, cylindricity and straightness **03**

(b) A circular shaft is welded to the support by means of circumferential fillet weld joint. The diameter of the shaft is 60 mm and it is subjected to torque of 2 kN-m. Find the size of the weld. The permissible shear stress of weld is 100 MPa. **04**

(c) Write down various theories of failure. Explain any two of them in detail with equations. **07**

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