

Enrollment No: _____

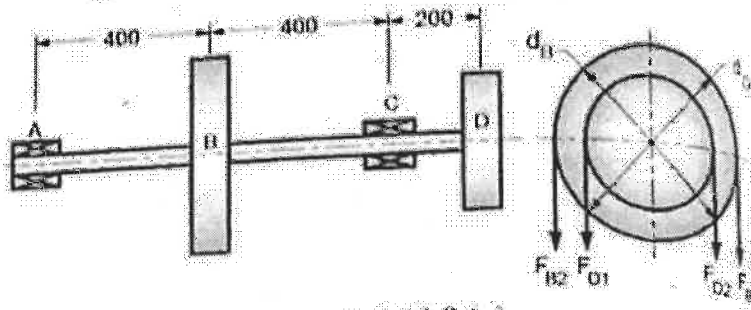
PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B. Tech Mid Semester Exam

Semester: VI
Subject Code: (203122355)
Subject Name: (Robot Dynamics and Manipulator Design)

Date: (29/01/2024)
Time: (1hr: 30min)
Total Marks: 40

Sr. No.		Marks
Q.1	(A) Five One-line Questions (1) Define modes of failure in machine design. (2) Why is the factor of safety important in machine design? (3) What is stress concentration in machine design? (4) Define fatigue failures in machine design. (5) What role do standards and codes play in machine design?	05
	(B) Five Fill in the blanks (1) Fatigue failures are often initiated by _____ or microstructural irregularities. (2) The factor of safety is the ratio of _____ to the maximum stress a material can withstand. (3) Transmission shafts transfer _____ from one component to another in a machine. (4) Stress concentration occurs at _____ points in a machine element. (5) Remedies for stress concentration may involve _____ the geometry or using fillets.	05
Q.2	Attempt any four (Short Questions) (1) Explain Basic Procedure of Design of Machine Elements with suitable diagram. (2) Write a short note on theories of static failure with suitable diagram. (3) A mild steel shaft transmits 20 kW power at 200 rpm. If the allowable shear stress for shaft material is 42 MPa, determine the diameter of shaft. (4) What is stress and strain? Explain them with suitable units. (5) Write a short note on Young's Modulus or Modulus of Elasticity and Poisson's ratio.	12
Q.3	Attempt any two questions (1) A manufacturer is interested in starting a business with five different models of tractors ranging from 7.5 to 75 kW capacities. Specify power capacities of the models. There is an expansion plan to further increase the number of models from five to nine to fulfill the requirement of farmers. Specify the power capacities of the additional models. (2) What is key and its functions? Explain types of keys with neat figures. (3) It is required to design a square key for fixing a gear on a shaft of 25 mm diameter. The shaft is transmitting 15 kW power at 720 rpm to the gear. The key is made of steel 50C4 ($S_{yt} = 460 \text{ N/mm}^2$) and the factor of safety is 3. For key material, the yield strength in compression can be assumed to be equal to the yield strength in tension. Determine the dimensions of the key.	08
Q.4	(A) What are couplings? Explain their purpose. Write minimum five differences between rigid and flexible couplings.	05

- (B) A counter shaft with the bearings 800 mm apart receives 20kW power at 500 rpm through a pulley 300mm in diameter and mounted at an overhung of 200 mm. A 360 mm diameter pulley mounted midway between the bearings transmits torque to a shaft located below it. Both the pulleys have vertical belt tensions and the coefficient of friction between the belt and pulley is 0.3. if the required safety margin is 3. design the shaft using maximum shear stress theory Use the following properties for shaft material.
1. Ultimate tensile strength=700 N/mm²,
 2. Yield strength in tension=460 N/mm²



OR

- (B) What is endurance limit? Explain procedure to determine Endurance limit stress of a rotating beam specimen subjected to reversed bending stress with the help of neat figure.