

**GUJARAT TECHNOLOGICAL UNIVERSITY****BE - SEMESTER-IV (NEW) EXAMINATION – SUMMER 2021****Subject Code:2141907****Date:08/09/2021****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
<b>Q.1</b>	(a) Describe the various types of loads on machine components.	<b>03</b>
	(b) State the types of stresses and explain any two of them in detail.	<b>04</b>
	(c) List out theories of failure. Explain any one in brief.	<b>07</b>
<b>Q.2</b>	(a) What is key? What are the different types of key?	<b>03</b>
	(b) Differentiate between flexible coupling and coupling. State the different application of coupling.	<b>04</b>
	(c) Design a cast iron split muff coupling to transmit a power of 10 KW at 250 rpm. Consider an overhead of 25%. The allowable shear stress in the shaft and key is 36 MPa and for the muff 16MPa. Take the coefficient of friction 0.3 and the tensile strength of high tensile bolts 150 MPa.	<b>07</b>
<b>OR</b>		
	(c) Draw and design a bushed pin type flexible coupling.	<b>07</b>
<b>Q.3</b>	(a) What do you understand by the term welded joint? How it differs from riveted joint	<b>03</b>
	(b) What are the different types of lever? Explain any one.	<b>04</b>
	(c) Briefly explain the general procedure for bell crank lever.	<b>07</b>
<b>OR</b>		
<b>Q.3</b>	(a) Define cotter. Why taper is provided on a cotter?	<b>03</b>
	(b) Draw the figure of knuckle joint showing all necessary dimensions also explain its advantages.	<b>04</b>
	(c) Explain eccentric loading in machine parts.	<b>07</b>
<b>Q.4</b>	(a) How the hollow shafts are beneficial over the solid shaft?	<b>03</b>
	(b) Write a difference between shaft, spindle and axle.	<b>04</b>
	(c) A shaft transmit 75 KW power at 300rpm load is gradually applied. It is also subjected to B.M. of 500 N-m, Shear stress in shaft material should not exceed 40 N/mm <sup>2</sup> . Shaft must not twist more than 2° per meter length. Modulus of rigidity of shaft material is 0.8 X 10 <sup>5</sup> N/mm <sup>2</sup> . Find the diameter of solid shaft. If the shaft chosen is hollow with inside to outside diameter ratio = 0.5, find the size of the hollow shaft. What is the percentage saving in material by using hollow shaft instead of solid shaft?	<b>07</b>
<b>OR</b>		
<b>Q.4</b>	(a) Differentiate between beam and column.	<b>03</b>
	(b) State the assumption made in Euler's theory.	<b>04</b>
	(c) State Johnson's formula for buckling of columns.	<b>07</b>

- Q.5** (a) What do you mean by eccentric loaded welded joint? **03**  
(b) Draw the figure of different 1. Cap screws 2. Set screws. **04**  
(c) Show, by neat sketches, the various ways in which a riveted joint may fail. **07**

**OR**

- Q.5** (a) Explain with the figure, different types of threads used in power screws. **03**  
(b) What is self-locking and overhauling of power screw? Explain the condition for self-locking. **04**  
(c) A square threaded, triple start power screw, used in a screw-jack, has a nominal diameter of 50 mm and a pitch of 8 mm. the screw jack is used to lift a load of 12 kN. The co-efficient of friction at thread surface and collar surface can be considered as 0.15 and collar friction is negligible. Using the uniform wear theory for collar friction, calculate **07**  
1. Torque required to raise the load  
2. Torque required to lower the load.  
3. the force required to raise the load, if applied at a radius of 400 mm.

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