

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-IV (NEW) EXAMINATION – WINTER 2018

Subject Code:2141907

Date:10/12/2018

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.

		MARKS
Q.1	(a) What is the difference between Drawing, Drafting and Design?	03
	(b) Define limits, fits and tolerance.	04
	(c) In a hub and pin assembly, the lower and upper limits on the inner diameter of the hub are 40.000mm and 40.021 mm respectively, while the lower and upper limits on the diameter of pin are 40.028 and 40.041mm respectively. Determine	07
	(i) The tolerance on hub diameter; (ii) The tolerance on pin diameter; and (iii) The allowance. With the figure state the type of the fit of the assembly.	
Q.2	(a) What is key? What are the different types of key	03
	(b) What are the requirements of good couplings?	04
	(c) Design a cast iron protective type flange coupling to transmit 15 kW power at 900 r.p.m from an electric motor to a compressor. The service factor may be assumed as 1.7. The permissible stresses are as follows	07
	1. Shear stress for shaft, bolt and key = 40 MPa 2. Crushing stress for bolt and key = 80 MPa 3. Shear stress for cast iron flange = 8 MPa Standard shaft diameters are: 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40 Take number of bolts as 3.	
	OR	
	(c) Draw and design a bushed pin type flexible coupling.	07
Q.3	(a) Define cotter. Why taper is provided on a cotter?	03
	(b) What is lever? What are the different types of lever?	04
	(c) Briefly explain the general procedure for lever design.	07
	OR	
Q.3	(a) Define factor of safety.	03
	(b) Determine the principal stresses for a 35mm diameter rod, supported at one end as a cantilever, subjected to an axial compressive load 15 kN and a twisting moment 250 N-m	04
	(c) Design a knuckle joint to connect two circular mild steel rods which are subjected to a tensile load of 63kN. The allowable stresses are: 80MPa in tension, 56 MPa in shear and 80MPa in crushing.	07

- Q.4** (a) How the hollow shafts are beneficial over the solid shaft? **03**
 (b) Write a difference between shaft, spindle and axle. **04**
 (c) A 600 mm diameter pulley transmit 16kW power at a speed of 400 r.p.m. **07**
 A pulley is mounted on a cantilever shaft at a distance of 200 mm from the nearest bearing. Two weight of pulley is 1500 N and is driven by a horizontal belt drive. If the co-efficient of friction between belt and pulley is 0.3 and the angle of lap is 180° , determine the shaft diameter. Shaft made of plain carbon steel 40C8 ($s_{yt} = 330 \text{ N/mm}^2$ and $s_{ut} = 620 \text{ N/mm}^2$). Take the fatigue and shock factors as $k_b = 2.0$ and $k_f = 1.5$.

OR

- Q.4** (a) Differentiate between beam and column. **03**
 (b) State and explain the Castigliano's theorem. Write its application. **04**
 (c) Calculate the diameter of a piston rod for a cylinder of 1.5 m diameter **07**
 in which the greatest difference of steam pressure on two sides of piston is 0.2 N/mm^2 . The piston rod is made of mild steel ($E = 200 \text{ kN/mm}^2$) and is secured to the piston by a tapered rod and nut. The outer end piston rod is connected to cross-head by cotter. The length of rod is 3 m, while the required factor of safety is 8.

- 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 50mm and a pitch of 8mm. the screw jack is used to lift a load of 7.5kN. The co-efficient of thread friction is 0.12 and collar friction is negligible. If the length of nut is 48mm, calculate **07**
 1. The principal shear stress in the body
 2. The transverse shear stress in screw and nut and
 3. The bearing pressure.
 State whether the screw is self-locking.
