Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III EXAMINATION – SUMMER 2016

Subject Code:131902 **Date:31/05/2016**

Subject Name:Machine Design & Industrial Drafting

Time:10:30 AM to 01:30 PM **Total Marks: 70**

Instructions:

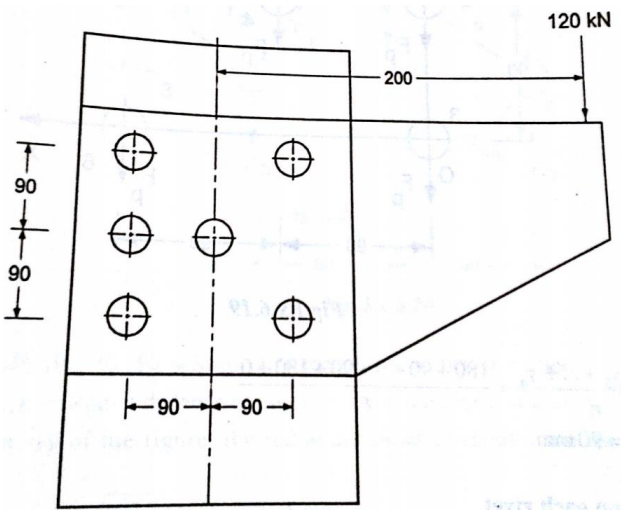
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1	**(a)**	1. Explain assembly drawing, detailed drawing and production drawing.	**04**
		2. What is surface roughness? How is it measured and represented?.	**03**
	(b)	Define the following : 1) Clearance fit 2) Nominal size 3) Factor of Safety 4) Bending Stress 5) Bearing Stress 6) Static Load 7) Shock Load.	**07**
Q.2	**(a)**	What is eccentric loaded welded joint? Explain step by step design procedure for such a joint.	**07**
	(b)	Design longitudinal joint for boiler whose diameter is 2.2 meters and is subjected to a pressure of 0.8 N/mm^2. The longitudinal joint is a triple riveted butt joint with efficiency of about 85%. The pitch in outer rows of rivets is to be double than in inner rows and width of cover plates are unequal. The allowable stresses are: σ_t = 80 MPa; τ = 52 MPa and σ_c = 95 MPa.	**07**
		OR	
	(b)	The eccentric load acting on a bracket is 120 kN as shown in figure 1. Determine the diameter of rivet assuming all rivets of same size. The permissible shear stress for rivet material is 100 MPa.	**07**
Q.3	**(a)**	Explain step by step design procedure for turnbuckle.	**07**
	(b)	Design a knuckle joint to transmit tensile load of 46 kN. Permissible stresses are 90 MPa, 120 MPa and 60 MPa in tension, crushing and shear respectively.	**07**
		OR	
Q.3	**(a)**	What is stress concentration? Explain various methods with neat sketches to relieve stress concentration.	**07**
	(b)	For operating exhaust valve of IC engine, maximum load required on valve is 6000 N. The rocker arm oscillates around a pin whose centre line is 260 mm away from valve axis. The two arms of rocker are equal and make an included angle of 155°. Design the rocker arm with fulcrum assuming rectangular arm cross-section. The permissible stresses for both the pins and lever material are: σ_t = 75 MPa; τ = 50 MPa and bearing pressure on pins, p_b = 08 MPa. Assume cross-section of the rocker arm as rectangular.	**07**
Q.4	**(a)**	Explain design procedure for sunk and splined key with neat sketches.	**07**
	(b)	A hollow shaft with diameter ratio 0.7 is required to transmit 500 kW at 300 rpm with a uniform twisting moment. Allowable shear stress is 65 MPa and the twist in length of 2.4 m is not to exceed 1 degree. Calculate the external diameter of the shaft satisfying these conditions. Modulus of rigidity = 8.2 x 10^4 MPa.	**07**
		OR	

Q.4	**(a)**	**1.**	"Square key is stronger against crushing than rectangular key". Justify.	**04**
		2.	Differentiate between shaft, spindle and axle.	**03**
	(b)		Design a cast iron split muff coupling to transmit a power of 12 kW at 300 rpm. Consider an overload of 15%. The allowable shear stress in the shaft and key is 35 MPa and for the muff 15 MPa. Take the co-efficient of friction 0.3 and tensile strength of bolts 150 MPa.	**07**
Q.5	**(a)**	**1.**	Explain three basic types of levers with practical examples.	**04**
		2.	Derive the formula for efficiency of square threaded screw.	**03**
	(b)		A double start square threaded power screw of 30 mm nominal diameter and 6 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of collar are 50 mm and 30 mm respectively. The coefficient of friction for thread and collar are 0.25 and 0.18 respectively. The screw rotates at 12 rpm. Assuming uniform wear conditions and allowable bearing stress as 6.3 MPa, Find (1) the torque required to rotate the screw, (2) the stresses in the screw and (3) the height of nut.	**07**

OR

Q.5	**(a)**		Design a right angled bell crank lever. The horizontal arm is 500 mm long and a load of 4.5 kN acts vertically downward through a pin in the forked end of this arm. At end of 150 mm long vertical arm, a force P acts at right angles to its axis through a pin into a forked end. The permissible stresses for both pins and lever material are: σ_t = 76 MPa; τ = 57 MPa and bearing pressure on pins, p_b = 10 MPa.	**07**
	(b)		Explain any seven AutoCAD command with example.	**07**



(Figure. 1, All dimensions are in mm)

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