Seat No.: _____ **Enrolment No._____**

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2141907 **Date:28/05/2018**

Subject Name:Machine Design & Industrial Drafting

Time:10:30 AM to 01:00 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. Draw standard symbol of surface roughness measurement.	**03**
	(b)	2. Explain different types of fits with neat sketch.	**04**
	(c)	1. Explain Mohr's circle diagram for principal stresses.	**03**
		2. Define basic size, actual size and limits.	**04**
Q.2	**(a)**	Explain selection and use of theories of failures.	**03**
	(b)	A cantilever beam of I-section supports an electric motor weighing 1000 N at a distance of 400 mm from the fixed end. If the allowable strength of the beam material is 100 N/mm^2, determine the section of the beam. The proportions of I-section are B = 4*t* and H = 6*t*, where *t* is the thickness of the flange as well as that of the web.	**04**
	(c)	A bolt is subjected to a direct load of 25 kN and shear load of 15 kN. Considering (i) maximum normal stress (ii) maximum shear stress and (iii) von-Mises theories of failure, determine a suitable size of the bolt, if the material of the bolt is C15 having 200 N/mm^2 yield strength. Take Factor of safety = 2.	**07**
		OR	
	(c)	What are the possible failures of pin in knuckle joint? Explain with neat sketches.	**07**
Q.3	**(a)**	Define factor of safety. List the factors affecting its value.	**03**
	(b)	What do you mean by a column? What is the effect of end condition on the crippling load capacity of a column?	**04**
	(c)	Design a cotter joint to connect two mild steel rods. The joint is subjected to a 20 kN tensile force. The allowable limits of tensile, shear and crushing strength are 60 N/mm^2, 40 N/mm^2 and 75 N/mm^2.	**07**
		OR	
Q.3	**(a)**	Define short columns, long columns and critical load of column.	**03**
	(b)	What is uniform strength concept used in the design of cotter joint?	**04**
	(c)	A 25 X 50 mm bar of rectangular cross-section is made of plain carbon steel 40C8 (σ_{yt} = 380 N/mm^2 and E = 207 000 N/mm^2). The length of the bar is 500 mm. The two ends of the bar are hinged and the factor of safety is 2.5. The bar is subjected to axial compressive force. (i) Determine the slenderness ratio; (ii) Which of the two equations-Euler's or Johnson's-will you apply to the bar? (iii) What is the safe compressive force for the bar?	**07**
Q.4	**(a)**	Give classification of shafts on basis of their industrial application.	**03**
	(b)	Describe the muff coupling with neat sketch and indicate standard dimensions in it. Also write the design equation of muff coupling.	**04**
	(c)	It is required to design a square key for fixing a gear on the shaft which transmits 10 kW power at 720 rpm. The shaft and the key are both made of plain carbon	**07**

steel C45 (σ_{yt} = 360 N/mm^2) and the factor of safety is 3. Take allowable shear stress, $\tau = 0.577\ \sigma_t$.

OR

Q.4 **(a)** What is a coupling? Classify the couplings. **03**

(b) A flywheel is mounted on a horizontal shaft. The flywheel which also acts as pulley is of 1.5 m diameter and has belt tensions 5.4 kN and 1.8 kN on tight and slack side, respectively. The overhang of the flywheel is 250 mm. The weight of the flywheel is 15 kN. Determine the shaft diameter if the maximum allowable shear strength is 50 N/mm^2. Design the shaft using ASME code. Consider shock and fatigue factors as 2 and 1.5 respectively. **04**

(c) Explain different types of keys with their neat sketches. **07**

Q.5 **(a)** Define pitch, transverse pitch and diagonal pitch of riveted joints. **03**

(b) A plate, 75 mm wide and 10 mm thick, is joined with another steel plate by means of single transverse and double parallel fillet welds, as shown in Fig. 1. The joint is subjected to a maximum tensile force of 55 kN. The permissible tensile and shear stresses in the weld material are 70 N/mm^2 and 50 N/mm^2 respectively. Determine the required length of each parallel fillet weld. **04**

(c) Derive the expression for torque and efficiency of a power screw. **07**

OR

Q.5 **(a)** Write application of screw threads. Also list most popular forms of threads. **03**

(b) Describe various locking systems for screw fastening to make it resistant to unscrewing under the effect of external force. **04**

(c) A bracket, attached to a vertical column by means of four identical rivets, is subjected to an eccentric force of 25 kN as shown in Fig. 2. Determine the diameter of rivets, if the permissible shear stress is 60 N/mm^2. **07**

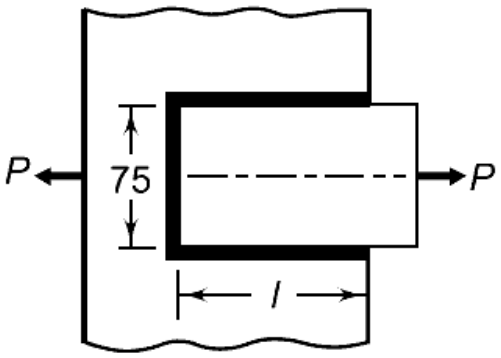

Fig. 1

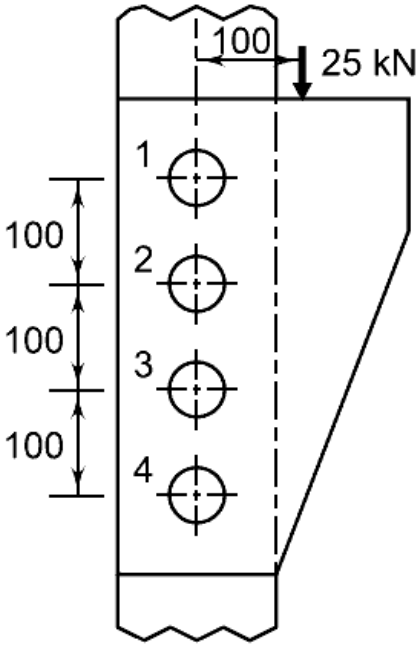

Fig. 2

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