Seat No.: _____ Enrolment No.

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–III (NEW) EXAMINATION – SUMMER 2019

Subject Code: 2130103 **Date: 04/06/2019**

Subject Name:Analysis Of Mechanisms & Machine Elements

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.**

Q.1	**(a)**	What are the factors affecting for selection of factor of safety in design of machine component?	**03**
	(b)	Define: Kinematic pair. Give detail classification of kinematic pair with suitable examples.	**04**
	(c)	Define the following terms: (a) Impact stress (b) Volumetric strain (c) Bulk modulus (d) Poisson's ratio (e) Principle stress (f) Factor of safety (g) Bearing stress.	**07**
Q.2	**(a)**	Explain the following terms. (i) Grashof's law (ii) Velocity of rubbing (iii) Corioli's acceleration	**03**
	(b)	What are the rules for locating I-center in velocity analysis of mechanism?	**04**
	(c)	In Fig. 1, the angular velocity of the crank OA is 600 r.p.m. Determine the linear velocity of the slider D and the angular velocity of the link BD, when the crank is inclined at an angle of 75° to the vertical. The dimensions of various links are: OA = 28 mm; AB = 44 mm; BC = 49 mm; and BD = 46 mm. The centre distance between the centres of rotation O and C is 65 mm. The path of travel of the slider is 11 mm below the fixed-point C. The slider moves along a horizontal path and OC is vertical.	**07**
		OR	
	(c)	In a pin jointed four bar mechanism, as shown in Fig. 2, AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC.	**07**
Q.3	**(a)**	Explain the difference between caulking and fullering process with the help of neat sketches.	**03**
	(b)	Discuss the different failures of rivetted joint with neat sketches.	**04**
	(c)	A double riveted lap joint is made between 15 mm thick plates. The rivet diameter and pitch are 25 mm and 75 mm respectively. If the ultimate stresses are 400 MPa in tension, 320 MPa in shear and 640 MPa in crushing, find the minimum force per pitch which will rupture the joint. If the above joint is subjected to a load such that the factor of safety is 4, find out the actual stresses developed in the plates and the rivets.	**07**
		OR	
Q.3	**(a)**	Explain design of shaft based on rigidity.	**03**
	(b)	Draw stress-strain relationship for ductile material and explain each terminology.	**04**
	(c)	A beam of rectangular cross section is welded to a support by means of fillet welds as shown in Fig. 3. Determine the size of the welds, if the permissible shear stress in the weld is limited to 75 N/mm^2.	**07**

Q.4 **(a)** Differentiate between shaft, axle and spindle. **03**

(b) Differentiate between machine, mechanism and structure. **04**

(c) A hollow shaft is required to transmit 600 kW at 110 r.p.m., the maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 Mpa and twist in a length of 3 metres not to exceed 1.4 degrees. Find the external diameter of the shaft, if the internal diameter to the external diameter is 3/8. Take modulus of rigidity as 84 Gpa. **07**

OR

Q.4 **(a)** Describe the general procedure for design of machine elements. **03**

(b) Explain any one inversion of double slider crank mechanism with suitable diagram. **04**

(c) A steel shaft 40 mm in diameter and 1.5 m length held rigidly at one end has a hand wheel 500 mm in diameter keyed to another end. The modulus of rigidity of steel is 80 GPa. Calculate (i) required tangential load to the rim of the wheel to produce torsional shear of 60 MPa, and (ii) angle of twist when this load is applied. **07**

Q.5 **(a)** Classify the pressure vessels and write down the design equations used for it. **03**

(b) Draw the tangential stress and radial stress distribution diagrams for thick cylindrical shell subjected to an internal pressure. **04**

(c) A seamless cylinder with a storage capacity of 0.025 m^3 is subjected to an internal pressure of 20 MPa. The length of the cylinder is twice its internal diameter. The cylinder is made of plain carbon steel 20C8 (Sut = 390 N/mm^2) and the factor of safety is 2.5. Determine the dimensions of the cylinder. **07**

OR

Q.5 **(a)** Explain the importance of dynamic analysis for rotating machinery. **03**

(b) Explain: (i) D'Almbert's principle (ii) Principle of virtual work **04**

(c) A hydraulic press exerts a total load of 3.5 MN. This load is carried by two steel rods, supporting the upper head of the press. If the safe stress is 85 Mpa and E = 210 kN/mm^2, find: 1. Diameter of the rods, and 2. Extension in each rod in a length of 2.5 m. **07**

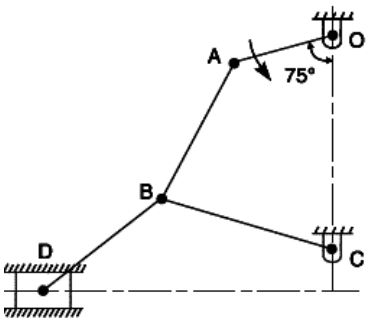

Fig. 1

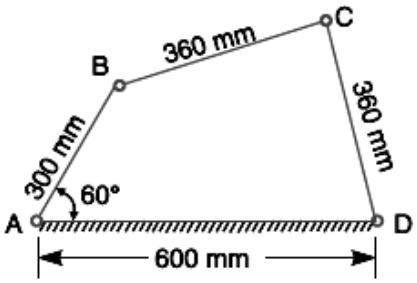

Fig. 2

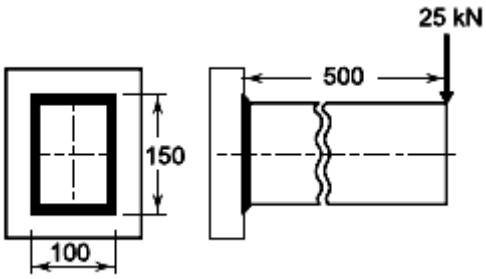

Fig. 3

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