Seat No.: _____

GUJARAT TECHNOLOGICAL UNIVERSITY

| GUJAKAI TECHNOLOGICAL UNIVERSITY BE - SEMESTER_IV (NEW) - EXAMINATION - SUMMER 2017 | | | | |
|--|-------------------|--|------------|--|
| Subject Code: 2142506 Date: 08/06 | | | | |
| Subi | iect [°] | Name: Fundamentals of Machine Design | | |
| Tim | ریار مر | (1).30 AM to 01.00 PM Total N | Iarke 70 | |
| Instru | c. IV Ictioi | | lai k5. 70 | |
| mour | 1. | Attempt all questions. | | |
| | 2. | Make suitable assumptions wherever necessary. | | |
| | 3. | Figures to the right indicate full marks. | | |
| Q.1 | 1 | Write answer of following short questions What useful information's are obtained from tensile test of ductile | 14 | |
| | | material? | | |
| | 2 | Define resilience. | | |
| | 3 | What do you mean by factor of safety? | | |
| | 4 | What is the material used for rivets? | | |
| | 5 | What is fullering? | | |
| | 6 | How welded joint differs from riveted joins. | | |
| | 7 | What are the assumptions made in the design of welded joint? | | |
| | ð | What is a cotter joint? | | |
| | 9 10 | Explain the purpose of turn buckle. What is a kay? State its functions | | |
| | 10 | Give three practical applications of couplings | | |
| | 11 | What types of stresses are induced in shaft? | | |
| | 12 | What do you understand by torsional rigidity of shaft? | | |
| | 13 | Define strut and column | | |
| Q.2 | (9) | Write advantages of welded joints over riveted joints | 03 | |
| | (\mathbf{a}) | Discuss important terms used in riveted joints | 03 | |
| | (\mathbf{c}) | Explain general considerations in machine design. | 07 | |
| | (-) | OR | | |
| | (c) | What is stress concentration? Explain various methods of reducing | 07 | |
| | | stress concentrations. | | |
| Q.3 | (a) | Explain purpose of turn buckle with sketch. | 03 | |
| • | (b) | Discuss the standard location of elements of a welding symbol. | 04 | |
| | (c) | Discuss various ways of failures of riveted joints. | 07 | |
| | | OR | | |
| Q.3 | (a) | Explain with neat sketch, how cotter joint is made? | 03 | |
| | (b) | Sketch two view of knuckle joint with indications of dimensions considered with proportions of diameters of shaft. | 04 | |
| | (c) | Design a knuckle joint to transmit 150 kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression | 07 | |
| Q.4 | (a) | Define shaft. Give properties of shaft materials. | 03 | |
| | (b) | Discuss design of shaft on the basis of rigidity. | 04 | |
| | (n) | Design a shaft to transmit power from an electric motor to a lathe head | 07 | |
| | (U) | stock through a pulley by means of a belt drive. The pulley weighs 200 | | |
| | | N and is located at 300 mm from the centre of the bearing. The | ; | |
| | | diameter of the pulley is 200 mm and the maximum power transmitted | l | |

is 1 kW at 120 r.p.m. The angle of lap of the belt is 180° and coefficient of friction between the belt and the pulley is 0.3. The shock and fatigue factors for bending and twisting are 1.5 and 2.0 respectively. The allowable shear stress in the shaft may be taken as 35 MPa.

OR

- Q.4 (a) Give classification of couplings.
 - (b) Explain various types of Sunk keys with neat sketch.
 - (c) Design and draw a protective type of cast iron flange coupling for a steel shaft transmitting 15 kW at 200 r.p.m. and having an allowable shear stress of 40 MPa. The working stress in the bolts should not exceed 30 MPa. Assume that the same material is used for shaft and key and that the crushing stress is twice the value of its shear stress. The maximum torque is 25% greater than the full load torque. The shear stress of cast iron is 14 MPa.
- **Q.5** (a) Give assumptions in Euler's column theory.

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- (**b**) Explain design of push rod.
- (c) Calculate the diameter of a piston rod for a cylinder of 1.5 m diameter in which the greatest difference of steam pressure on the two sides of the piston may be assumed to be 0.2 N/mm². The rod is made of mild steel and is secured to the piston by a tapered rod and nut and to the crosshead by a cotter. Assume modulus of elasticity as 200 kN/mm² and factor of safety as 8. The length of rod may be assumed as 3 meters.

OR

| Q.5 | (a) | Define lever and leverage. Why levers are usually tapered? | 03 |
|-----|------------|--|----|
| | (b) | Explain failure of a column or strut. | 04 |
| | (c) | Explain design procedure of levers. | 07 |
