

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:2151907

Date:20/11/2018

Subject Name:Design of Machine Elements

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.

| | | MARKS |
|------------|--|-----------|
| Q.1 | (a) Explain series of preferred number | 03 |
| | (b) State the advantages of chain drive over belt drive | 04 |
| | (c) Explain important design considerations for casting products | 07 |
| Q.2 | (a) Explain leaf spring with neat sketch | 03 |
| | (b) Explain springs in series and parallel connections with sketch | 04 |
| | (c) A spring having outer diameter of coil as 72 mm, deflects for 50 mm at the maximum load of 700 N. Calculate the wire diameter and number of turns for the spring if the shear stress is 300 MPa and modulus of rigidity 84 KN/mm ² . Take spring index of 8 | 07 |
| | OR | |
| | (c) Design a helical compression spring with plain ends made out of bronze for operating load range of 100 N to 150 N. The deflection of the spring is 6 mm and spring index = 9. The allowable shear stress for spring is 300 MPa and modulus of rigidity is 80 KN/mm ² . Determine (1) Diameter of spring wire (2) Mean coil diameter (3) Total number of turns (4) Stiffness of spring | 07 |
| Q.3 | (a) Explain effect of slip and creep on belt drive | 03 |
| | (b) List advantages and disadvantages of chain drive | 04 |
| | (c) The centre distance between two shafts is 4 m for a flat belt drive. The thickness of the belt is 10 mm. The driving pulley having 350 mm diameter is rotating with 1800 RPM. Driven pulley is rotating with 600 RPM. Considering slip of 5% determine outer diameter of driven pulley and belt length for (1) open belt drive (2) crossed belt drive | 07 |
| | OR | |
| Q.3 | (a) Explain effect of initial tension on belt drive | 03 |
| | (b) Explain working of (1) Compound belt drive (2) Fast and loose pulley belt drive with neat sketch | 04 |
| | (c) Design a V-belt drive from the given data. Motor power = 3.75 KW, Belt Width = 17 mm, Speed of motor = 1440 RPM, Belt thickness = 11 mm, Speed reduction = 4, Belt area = 140 mm ² , Density of belt = 1.5×10^{-5} N/mm ³ , Endurance limit for belt is 10N/mm ² | 07 |
| Q.4 | (a) What is pre-stressing? Why is it required in pressure vessels | 03 |
| | (b) A thin spherical shell with a storage capacity of 5000 litres is subjected to internal pressure of 1.5 N/mm ² . Determine the thickness of the shell. Take allowable stress for shell material = 75N/mm ² consider joint efficiency 75%. | 04 |
| | (c) Derive the equation of hoop stress and longitudinal stress for thin cylinder | 07 |

OR

- Q.4** (a) Explain any two types of end covers used in pressure vessels **03**
(b) An accumulator is required to store 175 litres of water at a pressure of 25 N/mm^2 . Assume the length of the stroke to be 3 meter. Determine **04**
(1) The diameter of the Ram (2) The internal diameter of the cylinder
(3) The thickness of the cylinder if the allowable stress of the cylinder made of cast iron is 60 N/mm^2
(c) Determine the maximum load using Soderberg equation simply supported 50 mm diameter beam centrally loaded as P to 3P N. The ultimate strength is 690 MPa, yield strength = 400 MPa, factor of safety = 1.5. Use size correction factor of 0.85 and surface finish factor of 0.9. consider length as 600mm. **mm.07**
- Q.5** (a) Find out the number of R5 basic series from 1 to 10 **03**
(b) What is stress concentration? Discuss any two methods of reducing it **04**
(c) Explain Goodman line design criteria for fluctuating stresses **07**
- OR**
- Q.5** (a) It is required to standardize 11 shafts from 100 to 1000 mm diameter. Specify their diameters. **03**
(b) Explain fluctuating stress in detail **04**
(c) Explain S-N diagram for steels with neat sketch **07**

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