

Roll No

AU/ME-504 (GS)**B.E. V Semester**

Examination, December 2017

Grading System (GS)**Machine Component Design***Time : Three Hours**Maximum Marks : 70*

- Note:** i) Attempt any five questions.
ii) All questions carry equal marks.

1. Explain :
 - i) S-N curve
 - ii) Soderberg equation
2. A round, steel tension member, 55 in. long, is subjected to a maximum load of 7000 lb.
 - i) What should be its diameter if the total elongation is not to exceed 0.030 in?
 - ii) Choose a steel that would be suitable on the basis of yield strength if the load is gradually applied and repeated (not reversed).

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3. A shaft carries a 1000N pulley in the centre of two ball bearings which are 2000mm apart. The pulley is keyed to the shaft and receives 30kW of power at 150rpm. The power is transmitted from the shaft through a flexible coupling just outside the right bearing. The belt drive is horizontal and the sum of the belt tension is 8000N. Calculate the diameter of the shaft if permissible stress in bending is 80N/mm^2 and in shear it is 45N/mm^2 .
4. A hollow shaft of diameter ratio is required to transmit 600kW at 110rpm, the maximum torque being 20% greater than mean. The shearing stress is not to exceed 62MN/m^2 and twist in length of three metres is not to exceed 1.4 degrees. Determine the diameter of the shaft. Assume modulus of rigidity for shaft material as 84GN/m^2 .
5. Design a helical spring for a safety valve. The valve must blow off at a pressure of 1.2MPa and should lift by 3mm for 5% increase in pressure. The valve diameter is 60mm. The max allowable shear stress is 400MN/m^2 and the modulus of rigidity is $82.7 \times 103\text{MN/m}^2$ take the spring index as 8.
6. Design a valve spring of a petrol engine for the following operating conditions:
 Spring load when valve is open = 420N
 Spring load when valve is closed = 270N
 Max. Inside dia. of spring = 25mm
 Length of spring when valve is open = 40mm
 Length of spring when valve is closed = 50mm
 Max strength = 400MPa

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7. Design a cone clutch to transmit a power of 45kW at a rated speed of 750rpm. Also determine:
- The axial force capacity.
 - The axial force necessary to transmit the torque.
 - The axial force necessary to engage the cone clutch.
8. Answer any four of the following:
- Draw Goodman's diagram. State its significance and applications.
 - How will you calculate load upon a shaft if it supports a pulley or when it supports a gear? How the strength of a steel material for shafting is estimated?
 - Define Spring Buckling. State the classifications of springs.
 - State about material for friction surface.
 - Explain the phenomena of boundary lubrication in journal bearing.
 - State brief about types of rolling contact bearing.
