

TE / Sem II / Prod / CBGS / May 17 / 09 / 06 / 17

QP Code : 608501



(3 Hours)

[Total Marks : 80

- N.B. :**
- (1) Question No. 1 is compulsory
 - (2) Attempt any Three questions from the remaining five questions.
 - (3) Assume any suitable data if necessary with justification.
 - (4) Figures to the right indicate full marks.
 - (5) Use of design data books such as PSG, Mahadevanare permitted.
 - (6) Draw neat sketches to support your answer wherever necessary.

1. Attempt **any four** of the following questions. 20
 - (a) Explain stress concentration in detail.
 - (b) Write a short note in bolts of uniform strength.
 - (c) What are the design considerations in casting
 - (d) Explain different stresses induced in a helical springs of a circular wire.
 - (e) Explain different types of rivetted joints.

2. (a) A Steel shaft transmitting 16KW at 200 rpm is supported on two bearings 800mm apart and has two gears keyed to it. The pinion having 30 teeth of module 5mm is located 150mm to the left of the right bearing and delivers power horizontally to the right. The gear having 100 teeth of module 5mm is located 200mm to the right of the left hand bearing and receives power in a vertical direction from below. Selecting suitable material and stresses determine the shaft diameter. Take $K_b=2$ and $K_t=1.5$. 14
 - (b) A cast iron cylinder of internal diameter 300 mm and thickness 50 mm is subjected to a pressure of 5 N/mm². Calculate the tangential and radial stresses at the inner, middle and outer surfaces. 6

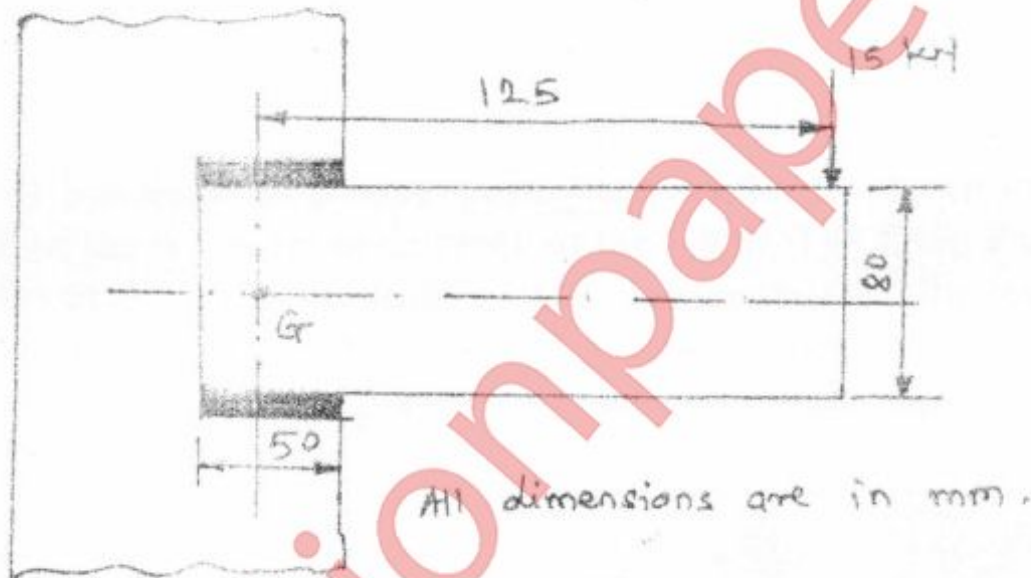
3. (a) Design a knuckle joint to resist safely a tensile load of 25 KN. Take suitable material and stresses for different parts of the joint. 12
 - (b) Design a spring a balance to measure 0 to 1000 N over a scale of length 80 mm. The spring is to be closed in a casing of 25 mm diameter. The approximate number of turns is 30. The modulus of rigidity is 85 KN/mm². Also calculate the maximum shear stress induced. 8

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- 4 (a) Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 m in diameter subjected to a stem pressure of 0.90 N/mm^2 . Assume joint efficiency as 85 %, allowable tensile stress in the plate 90 MPa, Compressive stress 125 MPa and shear stress in the rivet 70MP 10
- (b) A bracket a carrying a load of 15 KN is to be welded as shown in the figure. Find the size of weld required if the allowable shear stress is not to exceed 85 MPa. 10



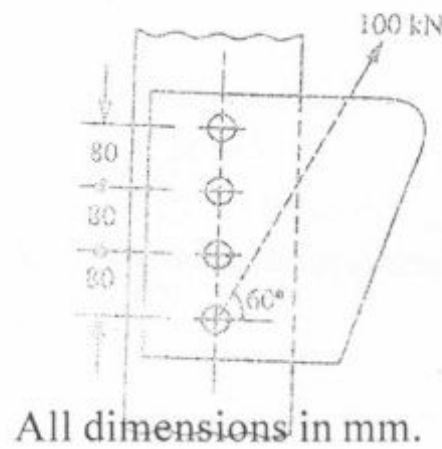
- 5 (a) A pair of straight teeth spur gear having 20° full depth involute teeth is to transmit 12 KW at 300 rpm of the pinion. The speed ratio is 3:1. The allowable static stresses for gear of cast iron and pinion of steel are 60 MPa and 105 MPa respectively. Design the module, face width both for the pinion and gear wheel. Use the following data: 10
- Number of teeth on pinion = 17
 Take face width as 10 times the module.
 Tooth form factor = $0.154 - (0.912)/n$, n = Number of teeth
 Velocity factor = $4.5/(4.5+V)$ where V - The pitch line velocity in m/sec.

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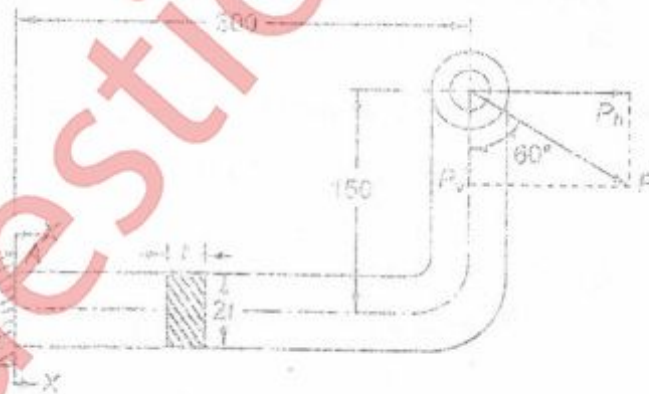
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- (b) A bracket supported by means of 4 rivets of same size is shown in the figure. The bolts are made of plain carbon steel 45C8 and factor of safety is 3. Find the size of the bolts. 10



6. (a) A wall bracket with a rectangular cross-section is shown in figure. The depth of the cross-section is twice of the width. The force P acting on the bracket at 60° to the vertical is 5 kN. The material of the bracket is grey cast iron FG200 and the factor of safety is 3.5. Determine the dimensions of the cross-section of the bracket. Assume maximum principal stress theory of failure. 10



- (b) The parallel sides of the trapezoidal cross section of a crane hook of capacity 90 kN are 90 mm and 25 mm, the depth of section being 116 mm. The radius of curvature of the inner fiber is 65 mm. Determine the total stresses at the extreme fibers of the cross section. 10