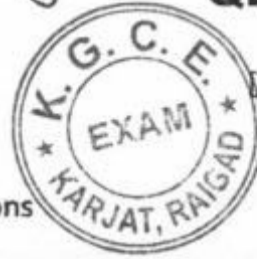


(3 Hours)



Total Marks: 80

N.B. (1) Question no.1 is compulsory

- (2) Answer any 3 questions out of the remaining questions
- (3) Assume suitable data if necessary.
- (4) Use of Design Data book is permitted.

1. Write short notes on the following: — 20
  - (a). Factor of safety
  - (b). Steps involved in design
  - (c). Types of keys and their application
  - (d). Nature of hoop and radial stresses distribution in a cylinder wall.
2. (a). A crane hook has a trapezoidal cross section with 90 mm x 25 mm as the lengths of its parallel sides and 115 as height. The Bed diameter of the crane hook is 80 mm and its lifting capacity is 100 N. Determine the stresses at inner and outer surfaces of the cross section. 10  
(b). Design a Knuckle joint to transmit 140 kN. The stresses may be taken as 80 MPa in Tension, 60 MPa in shear, 120 MPa in compression. 10
3. (a). Describe types and classification of gears and their application. 06  
(b). A shaft is supported on bearings A and B, 800 mm between centers. A 20° straight tooth spur gear having 500 mm pitch diameter, is located 200 mm to the right of left hand bearing A, and 600 mm diameter mm pulley is mounted 250 mm towards the left of bearing B. The gear is driven by a pinion with a downward tangential force while the pulley drives a horizontal belt having 180° angle of wrap. The pulley also serves as a flywheel and weighs 2500 N. The maximum belt tension is 3000 N and the tension ratio is 2:1. Determine the maximum bending moment and necessary shaft diameter if the allowable shear stress is 60 MPa. 14
4. (a). Describe types of shaft couplings and their applications. 06  
(b). A pair of spur gears is to transmit 25 kW from a shaft running at 200 r.p.m to another shaft to run at 600 r.p.m. The pinion is made of plain carbon steel while the gear is made up of Cast Iron. The ultimate stresses in the materials of pinion and gears is taken as 400 MPa and 250 MPa respectively. Both the pinion and gear are of 20°, full depth involute teeth. Use the following data:- 14

Face width = 14 times module

Factor of safety=2

No of teeth on pinion= 20

[TURN OVER

Tooth Form factor  $Y = 0.154 - (0.912/Z)$  where  $Z$  is the no. of teeth.

Velocity factor =  $3 / (3+v)$  where  $v$  is the pitch line velocity in m/s.

5. (a). List the advantages and disadvantages of welded joints over the riveted joints. 06
- (b). Design a double riveted butt joint with two cover plates for the longitudinal seam of a boiler shell 1.5 meters in diameter subjected to a steam pressure of 1 MPa . Assume joint efficiency 80% , allowable tensile stress in the plate is 90 MPa, Compressive stress 150 MPa and shear stress in the rivet is 60 MPa. 14
6. Write short notes on the following: – 20
- (a). Design of Leaf springs.
- (b). Failure modes of riveted joints
- (c). Material selection in design.
- (d). Threaded Joints

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