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Total No.of Pages:02

BTECH ,MAY –2014

DESIGN OF AUTOMOTIVE COMPONENTS

TIME: 3 HRS

Paper Code (BTAE-504),Paper Id. [A2064]

MM:60

NOTE: 1. Question no.1 is compulsory; attempt any ***four*** questions from 'section B' and attempt any ***two*** questions from 'section C'.
2. Use of design date book is permitted
3. Assume missing data suitably, if any.

Section A

Q1 Attempt all the parts [2X10]

i) What are the various types of stresses induced in the connecting rod?
ii) What is reliability factor?
iii) What information is obtained from Soderberg diagram?
iv) How is size of a gear tooth specified?
v) Explain interference and means to avoid it.
vi) What are the drawbacks of single shoe brake over double shoe brake?
vii) Where the concentric springs are used?
viii) List any four guidelines in respect of design for environment.
ix) How is material of shaft decided?
x) Sketch parallel and transverse welds.

Section B

Q2 What is factor of safety? Explain the basic reasons for taking factor of safety in designing an automotive component. [5]

Q3 A wall bracket is attached to a wall by means of four identical bolts, two at *A* and two at *B*, as shown in Fig. 1. Assuming that the bracket is held against the wall and prevented from tipping about point *C* by all four bolts using an allowable tensile stress in the bolts as 35 N/mm^2, determine the size of the bolts on the basis of maximum principle stress theory. [5]

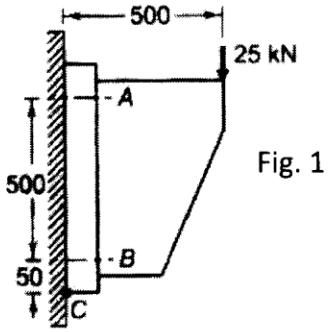

Fig. 1

Q4 A pair of spur gears consists of a 20 teeth pinion mashing with a 120 teeth gear. The module is 4mm. calculate: [5]
(i) the centre distance;
(ii) the pitch circle diameters of the pinion and the gear;
(iii) the addendum and the dedendum;
(iv) the tooth thickness; and
(v) the gear ratio

Q5 How are the bearings classified? Explain the criterion for selection of a particular bearing type. [5]

Q6 A plate 10 mm thick, subjected to a tensile load of 20 kN as shown in Fig. 2. The plate is made of cast iron (S_{ut} = 350 N/mm^2) and the factor of safety is 2.5. Determine the fillet radius. **[5]**

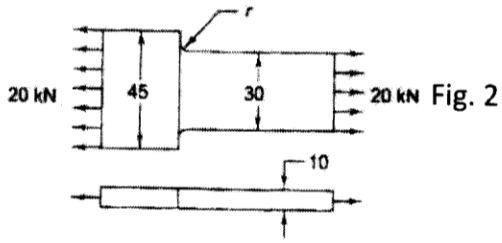

Fig. 2

Section C

Q7 A cone clutch is used to connect an electric motor running at 1440 rpm with a machine that is stationary. The machine is equivalent to a rotor of mass 150 kg and radius of gyration as 250 mm. The machine has to be brought to the full speed of 1440 rpm from a stationary condition in 40 sec. The semi-cone angle α is 12.5^0. The mean radius of the clutch is twice the face width. The coefficient of friction is 0.2 and the normal intensity of pressure between contacting surfaces should not exceed 0.1 N/mm2. Assuming uniform wear criterion, calculate: **[10]**

(i) The inner and outer diameters;
(ii) The face width of friction lining;
(iii) The force required to engage the clutch; and
(iv) The amount of heat generated during each engagement of clutch.

Q8 The brake shown in Fig. 3 is 300 mm in diameter and is actuated by a mechanism that exerts the same force *F* on each shoe. The shoes are identical and have a face width of 32 mm. The lining is molded asbestos having a coefficient of friction of 0.32 and a pressure limitation of 1000 kPa. Estimate the maximum **[10]**

(i) Actuating force *F* (ii) Braking capacity

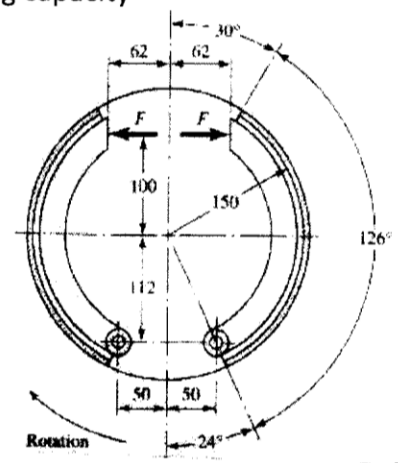

Fig. 3

Q9 A concentric spring is used as valve spring in a heavy duty diesel engine. It consists of two helical compression springs having the same free length and same solid length. The composite spring is subjected to a maximum force of 6000 N and the corresponding deflection is 50 mm. The maximum torsional shear stress induced in each spring is 800 N/mm^2. The spring index of each spring is 6. Assume same material for two springs and the modulus of rigidity of spring material is 81370 N/mm^2. The diametrical clearance between the coils is equal to the difference between their wire diameters. Calculate **[10]**

(i) The axial force transmitted by each spring
(ii)Write and mean coild diameter of each spring
(iii) Number of active coils in each spring