Roll No. | | | | | | | | | | | | Total No. of Pages : 2

Total No. of Questions : 09

B.Tech(AE) (2011 Onwards) (Sem.–5)

DESIGN OF AUTOMOTIVE COMPONENTS

Subject Code : BTAE-504

Paper ID : [A2064]

Time : 3 Hrs. Max. Marks : 60

INSTRUCTION TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students has to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students has to attempt any TWO questions.**

SECTION-A

1. Write short notes on :

(a) What are various types of design?

(b) Write various manufacturing considerations in design.

(c) Define factor of safety.

(d) What is the basic criterion of selection of material for automotive parts?

(e) Define spring index and spring rate.

(f) State Bending and Shear Stress.

(g) Describe self energizing brakes.

(h) Differentiate Internal and External expanding band brakes.

(i) What are various types of bearings?

(j) Draw a neat sketch of multi-leaf springs.

SECTION B

2. What is Product design? Explain in detail underlying principles of design in Aesthetics and ergonomics.

3. Describe in detail various theories of failures.

4. In a steam engine cylinder, the cylinder head is subjected to steam pressure of 0.8 N/mm^2. The cylinder head is held in position by means of 12 bolts and soft gasket is used to make joint leak proof. The effective diameter of cylinder is 400 mm. Find the size of bolts so that stresses in the bolts is not to exceed 100 Mpa.

   Assume :

   Initial tension due to tightening = 2840d

   K = 0.5 for soft gasket, and take $d_c = 0.84d$

5. Write short notes on 'Bolt of Uniform Strength'.

6. What are the advantages of split type flywheel over solid one piece fly wheel?

SECTION C

7. Design a flange coupling for steel shaft transmitting 20 kW power at 250 rpm. Maximum torque is 30 % greater than full load torque. Material properties are as follows:

   i. Allowable shear stress for shaft and key = 40 MPa

   ii. Allowable shear stress for bolts = 30 MPa

   iii. Allowable crushing stress for shaft and keys = 80 MPa

   iv. Allowable shear stress for flange = 14 MPa

   v. Allowable compressive stress for bolts = 60 MPa

   Take 4 bolts on P. C. D – 3d

8. What is coefficient of fluctuation of speed and fluctuation of energy? Explain its significance in design of flywheel.

9. A safety valve of 60 mm diameter is to blow off at a pressure of 1.2 MPa. It is held on its seat by closed coil helical spring. The maximum lift of the valve is 10 mm, design a suitable compression spring of spring index 5 and providing an initial compression of 35mm. the maximum shear stress in the material of the wire is limited to $500N/mm^2$. The modulus of rigidity of the spring material is 80000 N/mm^2. Calculate:

   a) diameter of spring wire

   b) mean coil diameter

   c) number of active turns

   d) Pitch of the coil.