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**BAS-010**

00222

# B.Tech. AEROSPACE ENGINEERING (BTAE)

## Term-End Examination

## December, 2017

## BAS-010 : MACHINE DESIGN

*Time : 3 hours* *Maximum Marks : 70*

***Note :*** *Attempt **any seven** questions. Assume missing data, if any. **All** questions carry **equal** marks. Use of scientific calculator (Non programmable) and machine Design Data Book is **permitted**.*

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**1.** **(a)** Explain the following : **5**

(i) Mass moment of inertia

(ii) Work

(iii) Power

(iv) Energy

(v) Force

**(b)** Explain with the help of sketches the following for Limit Systems. **5**

(i) Hole basis system

(ii) Shaft basis system

**2.** **(a)** Explain with the help of sketches the following : **5**

(i) Lap/Fillet welded joint.

(ii) Butt welded joint.

(b) A plate 100 mm wide and 10 mm thick is to be welded to another plate by means of double parallel fillets. The plates are subjected to a static load of 80 kN. Find the length of weld, if the permissible shear stress in the weld does not exceed 55 MPa. 5

3. (a) Draw a Stress - Strain diagram for mild steel under tensile test and discuss the following : 6
   (i) Proportional Limit
   (ii) Elastic Limit
   (iii) Yield Point

   (b) A mild steel rod supports a Tensile Load of 50 kN. If the stress in the rod is limited to 100 MPa, find the size of the rod when cross section is : 4
   (i) Circular (ii) Square

4. Find the diameter of a solid steel shaft to transmit 20 kW at 200 rpm. The ultimate shear stress for the steel may be taken as 360 MPa and a Factor of Safety as 2. 10
   If a hollow shaft is to be used in place of solid shaft, find the inside and outside diameters when the ratio of inside to outside diameters is 0.5.

5. (a) Describe the following types of Springs 4
   (i) Helical Spring
   (ii) Torsion Spring

   (b) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress in 350 MPa and Modulus of Rigidity 84 kN/mm$^2$, find the axial load which the spring can carry and the deflection per active turn. 6

6. (a) Explain the following terms used in gears with the help of sketches. 4

(i) Pressure angle or angle of obliquity

(ii) Circular Pitch

(b) Discuss different modes of failure of gear teeth and their possible remedies to avoid the failure. 6

7. (a) What do you understand by the efficiency of a Riveted Joint ? Discuss in brief. 4

(b) A double riveted, double cover butt joint in plates 20 mm. Thick is made with 25 mm diameter rivets at 100 mm pitch. The permissible stresses are $\sigma_t$=120 MPa, $\tau$ = 100 MPa and $\sigma_c$ = 150 MPa. 6

Find the efficiency of the joint, taking the strength of the rivet in double shear as twice than that of single shear.

8. (a) Discuss the following in the context of belt drives. Draw sketches wherever feasible. 4

(i) Types of belts.

(ii) Materials used for belts

(b) Two pulleys, one 450 mm diameter and the other 200 mm diameter, on parallel shafts 1.95 meters apart, are connected by a crossed belt. Find the length of the belt required and the angle of contact between the belt and each pulley. 6

What power can be transmitted by the belt when the larger pulley rotates at 200 rpm, if the maximum permissible tension in the belts 1kN, and the coefficient of friction between the belt and pulley is 0.25 ?

9. Discuss the following terms in relevance to Mechanical Properties of metals. **10**

(a) Ductility

(b) Resilience

(c) Fatigue

(d) Toughness

(e) Creep