TED (10) 4022
(Revision – 2010)

A21 – 01837

Reg. No…………………………
Signature ……………………….

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2021

DESIGN OF MACHINE ELEMENTS

[Maximum Marks: **100**] [Time: **3** Hours]

(PART-A)

[Maximum Marks: 10]

I. (Answer ***all*** the questions in one or two sentences. Each question carries ***2*** marks)

1. Define the term lead of screw thread.
2. Differentiate between spindle and axle.
3. Define the term bearing characteristics number.
4. What is lift or stroke of cam?
5. What is slip in belt drive? (5 x 2 = 10)

(PART-B)

[Maximum Marks: 30]

II. (Answer any ***five*** of the following questions. Each question carries ***6*** marks)

1. Draw a neat sketch for representing designation of screw thread.
2. Derive an expression to find the diameter of a hollow shaft which is subjected to a torque.
3. What you mean by overhauling and self-locking of screw jack.
4. Draw unprotected type flange coupling, marks the part and indicate the dimensions of each part if diameter of shaft is 'd'.
5. Give the advantages and disadvantage of ball bearing over journal bearing.
6. Make a comparison between belt drive and gear drive.
7. How governor is classified. (5 x 6 = 30)

(PART-C)

[Maximum Marks: 60]

(Answer ***one*** full question from each Unit. Each full question carries ***15*** marks)

UNIT – I

III. (a) With help of neat sketches explain different types of keys used. (10)

(b) A cylinder head of steam engine is held by 14 bolts. The effective diameter of cylinder is 350 mm, the steam pressure is 0.85Mpa. Find the size of bolt if permissible stress in the bolt is 20Mpa. (5)

OR

IV. (a) Explain general procedure in designing a machine. (7)

(b) A screw jack has a square threaded screw of mean diameter 50mm and pitch 10mm. The coefficient of friction between screw and nut is 0.13. Neglecting collar friction calculates the torque required to be applied on the screw for lifting a load of 25KN. (8)

UNIT – II

V. (a) A line shaft is to transmit 40 kW at 150 rpm. The shaft pieces are connected by muff coupling. Design the coupling assuming an over load of 25 percent. The following permissible stresses may be used. Shear stress for shaft and key material is 40Mpa, crushing stress for the key material is 90Mpa and shear for the muff material is 15Mpa. (10)

(b) Show that a hollow shaft has greater strength and stiffness that solid shaft of same length, material and weight. (5)

OR

VI. Explain general procedure for designing a unprotected type flange coupling. (15)

UNIT- III

VII. Draw the profile of a cam to give the following motion to a knife edged follower.

(i) Out stroke during 60^0 of cam rotation

(ii) Dwell for the next 30^0 of cam rotation

(iii) Return stoke during next 60^0 of cam rotation

(iv) Dwell for the remaining rotation of cam

The stroke of the follower is 20 mm and the maximum radius of the cam is 50 mm. The axis of the follower is offset by 20 mm from the axis of the cam. The follower moves with uniform velocity during both the outstroke and return stroke. (15)

OR

VIII. (a) A journal bearing whose diameter is 200 mm is subjected to a load of 50 KN and the shaft makes 100 rpm. Find the heat generated, if coefficient of friction is 0.02. (7)

(b) Draw neat sketch and explain the working of porter governor. (8)

UNIT - IV

IX. (a) Give the merits and demerits of chain drive over the belt drive. (7)

(b) A set of spur wheel for the gearing machine are arranged as follows: A drives B,C drives D and E drives F. Gears B and C and gears D and E are the compound wheels. When $T_A = 20$, $T_B=50$, $T_C= 25$, $T_D= 75$, $T_E= 26$ and $T_F= 65$ teeth. If gear a rotates in clockwise direction at 975 rpm, find the speed and direction of rotation of follower gear F. (8)

OR

X. (a) Two pulleys 600mm and 400mm diameters are connected by a belt, Central distance between the pulleys is 6 meters. Find the length of belt required for

(a) Open belt drive (b) Cross belt drive. (7)

(b) Illustrate the nomenclature of a spur gear with the help of necessary sketch. (8)

****