A22-06266

DIPLOMA EXAMINATION IN ENGINEERING/TECHNOLOGY/ MANAGEMENT/COMMERCIAL PRACTICE, APRIL – 2022

DESIGN OF MACHINE ELEMENTS

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

PART-A

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

1. Define pitch and lead in a screw thread.

2. Write the empirical formula for a rectangular sunk key.

3. Write the torsion equation for circular shaft.

4. Define the term hunting in a governor.

5. List any four advantages of chain drive over belt drive.   (5 x 2 = 10)

PART-B

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

1. List the various factors governing the design.

2. Show that the efficiency of a screw jack is independent of the load raised.

3. A hollow shaft have 200mm outside diameter and 150mm inside diameter. If the maximum allowable shear stress is 60 Mpa, what is the strength of the shaft.

4. Sketch and label with empirical formula of a unprotected type flange coupling.

5. Illustrate various displacement diagram for a cam motion.

6. Sketch and explain the turning moment diagram for a single cylinder four stroke IC engine.

7. Write the advantages and disadvantages of gear drive.   (5 x 6 = 30)

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

UNIT – I

III. (a) List various types of keys.   (7)

(b) The effective diameter of a cylinder is 0.4m and the highest pressure of steam acting on the cylinder head is 1.1Mpa. Allowable stress in tension of bolt material is 32 Mpa. If the cylinder head is held by 12 bolts, find the size of the bolts. (8)

OR

IV. (a) Explain the bolt of uniform strength with various method of manufacturing. (7)

(b) A screw jack having square threads of 40mm mean diameter and 12mm pitch is operated by a 450 mm long hand lever. Coefficient of friction at the threads is 0.1. Determine the effort needed to be applied at the end of the lever to lift a load of 20 KN. (8)

UNIT – II

V. (a) A hollow shaft have 200mm outside diameter and 150mm inside diameter. If the maximum allowable shear stress is 50 MPa, what is the strength of the shaft. (7)

(b) Briefly describe the design procedure of a muff coupling. (8)

OR

VI. (a) A shaft has to transmit 105 KW at 160 rpm. If the stress is not to exceed 65 Mpa and twist in a length of 3.5m must not exceed 1^0, find the suitable diameter. Take G=80Gpa. (7)

(b) Compare a hallow shaft and a solid shaft having same material, length and weight but different strength. (8)

UNIT- III

VII. (a) Sketch and label the cam terminology. (7)

(b) A Journal bearing having a diameter of 65mm is subjected to load of 5KN at a speed of 200 rpm. If the length to diameter ratio is 3, and coefficient of friction 0.02, find the bearing pressure and heat generated. (8)

OR

VIII. (a) Briefly explain the classification of bearings. (7)

(b) A cam is to be designed for a knife edge follower with the following data. Cam lift = 40mm during 90^0 of cam rotation with SHM, dwell for the next 30^0. During the next 60^0 of cam rotation, the follower returns to its original position with SHM, dwell during the remaining 180^0. Draw the profile of the cam when line of stroke is offset 20mm from the axis of the cam shaft. The radius of the base circle of the cam is 40mm. (8)

UNIT - IV

IX. (a) Illustrate reverted gear train mechanism and its applications. (7)

(b) Find the power transmitted by a belt running over a pulley of 600mm diameter at 200 rpm. The coefficient of friction between the belt and the pulley is 0.25. angle of lap 160^0 and the maximum tension in the belt is 2.5KN. (8)

OR

X. (a) Briefly explain slip and creep of a belt drive. (7)

(b) A 300 mm diameter pulley running at 200 rpm is connected by belt to another pulley at a distance of 3 m. The second pulley has to rotate at 120 rpm. If the belt is 5mm thick and slip between belt and the pulley is 3% at each stage, determine the diameter of second pulley. Also find the length of the belt if the drive is an open belt drive. (8)

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