C09–M–**605**

3783

BOARD DIPLOMA EXAMINATION, (C–09)

OCT/NOV—2013

DME—SIXTH SEMESTER EXAMINATION

DESIGN OF MACHINE ELEMENTS

Time : 3 hours] [*Total Marks* : 80

PART—A

Instructions : (1) Answer **all** questions.

(2) Each question carries **three** marks.

(3) Answer should be brief and straight to the point and shall not exceed *five* simple sentences.

1. List out any six factors to be considered while designing a product or element.

2. *(a)* A thread is designated by M 24 × 3 – 7d. What does it mean?

   (b) Define 'lead'. Also give equation for lead of double-strat thread in terms of pitch.

3. Write the formulae for any three stresses induced in screw fastener when it tightened.

4. A solid shaft transmits 40 kW power at 8 revolutions per second. The permissible shear stress of shaft material is 40 N/mm^2. Compute its diameter.

5. Compute torque transmitted and shearing stresses induced in square key of 12 mm side and 75 mm long placed in a 50 mm diameter shaft, if 15 kW power is transmitted at 200 r.p.m.

6. Two pulleys, 400 mm and 800 mm diameter which are fixed to two parallel shafts 4 m apart, are connected by open belt. Find the length of the belt required.

7. A wheel has 36 teeth and a circular pitch 24 mm. Find *(a)* pitch circle diameter, *(b)* diametral pitch and *(c)* module.

8. Define *(a)* cam angle, *(b)* base circle and *(c)* dwell.

9. What is a turning moment diagram? Draw a simple turning moment diagram for a 4-stroke engine.

10. Define the effort and power of a governor.

PART—B

Instructions : (1) Answer *any* **five** questions.

(2) Each question carries **ten** marks.

(3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. *(a)* Explain the step-by-step procedure for designing a machine element.

(b) Define the following :

(i) Hardness

(ii) Toughness

(iii) Resilience

(iv) Creep

12. *(a)* What size of an axial hole must be drilled in M 24 bolt to make it uniform strength?

(b) The logitudinal stay bolts of a short boiler are pitched at 350 mm horizontally and vertically. The steam pressure is 0.85 N/mm^2. Find the diameter of the bolts when the tensile strength of stay bolt material is 56 N/mm^2.

13. An MS shaft transmits 40 kW at 280 r.p.m. Maximum torque transmitted exceeds torque by 25%. Maximum shear stress is 60 N/mm^2 and the angle of twist should not exceed 1° in a length of 20 diameter. Modulus of rigidity (G) is 80 G N/mm^2. Compute the diameter of shaft.

14. Design and draw a cast iron muff coupling using the following data :

(a) Mild steel shaft transmits 100 kW at 250 r.p.m.

(b) Allowable shear and crushing stresses for the shafts and key material are 80 N/mm^2 and 120 N/mm^2 respectively

(c) The permissible shear stress in the muff is 20 N/mm^2, assume that maximum torque transmitted is 20% greater than the mean torque

15. A leather belt of 9.0 mm thick transmits 35 kW power from a pulley of 1.0 m diameter running at 200 r.p.m. The angle of lap is 130° and the coefficient of friction is 0.3. Find the width of the belt required if the permissible stress in the belt material is 2.5 N/mm^2.

16. A lathe back gear arrangement is to provide a total speed reduction of about 12 : 1 from the cone pulley to the spindle which are co-axial. The module of high speed and low speed pairs are 4 mm and 6 mm respectively. Determine the number of teeth and the exact total reduction on the different wheels, if the pinions have nearly equal teeth. The centre distance is 240 mm.

17. *(a)* Write the difference between belt and chain drive.

(b) A set of gears has to transmit 30 kW, when the pinion rotates at 400 r.p.m. The gear ratio is 1 : 4, the permissible stresses for pinion and driver gear materials are 130 N/mm^2 and 110 N/mm^2 respectively. The pinion gear has 22 teeth and face width is 12 times the module. Compute *(i)* module and *(ii)* face width.

18. A cam is to give the following motion to a knife-edged follower :

(a) Outstroke during 90° of cam rotation

(b) Dwell for the next 30° of the cam rotation

(c) Return stroke during next 120° of cam rotation

(d) Dwell for remaining 120° of cam rotation

The stroke of follower is 40 mm and the minimum radius of the cam is 50 mm. The follower moves with uniform velocity during both the outstroke and return strokes. Draw the profile of the cam when the axis of the follower passes through the axis of the camshaft.

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