C09–M–605

3783

BOARD DIPLOMA EXAMINATION, (C–09)
OCT/NOV—2016
DME—SIXTH SEMESTER EXAMINATION

DESIGN OF MACHINE ELEMENTS

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

PART—A   3×10=30

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

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

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

1. List six important mechanical properties of metals.

2. List out the various types of screw fastenings.

3. A thread is designated by M24X3-7d. What does it mean?

4. Explain the terms shaft, axle and spindle.

5. List out the various types of keys.

6. Write down expression for a length of *(a)* open belt and *(b)* crossed belt.

7. Define module and diametral pitch.

8. How do you classify the followers?

9. Define the following :

(a) Coefficient of fluctuation of speed

(b) Coefficient of fluctuation of energy of fly wheel

10. Write the differences between fly wheel and Governor.

PART—B   10×5=50

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) A hole of 20 mm diameter is to be punched in MS plate of 10 mm thickness. Find the shear stress developed if the ultimate strength is 800 N/mm^2.

(b) What are the stresses induced in screwed fastners?

12. A steam engine cylinder of 250 mm effective diameter is subjected to a steam pressure of 1·2 N/mm^2. The cylinder cover is connected by means of 6 bolts. The bolts are tightened with initial load of 1·5 times that of steam load. A copper gasket of stiffness factor 0·5 is used to make the joint leak proof. Find the size of the bolts so that the stress induced in the bolts is not to exceed 100 N/mm^2

13. A shaft supported at its ends in a ball bearing carries a central load of 800 N is to transmit 6 kW running at 100 r.p.m. The distance between the centres of bearings is 500 mm and the allowable tensile stress is 40 N/mm^2. Determine the size of the shaft.

14. Design a CI flange coupling to connect two shaft in order to transmit 8 kW at 720 r.p.m. The following permissible stresses may be assumed :

Permissible shear stress for shaft, bolts and
$$\text{key material} = 33 \text{ N/mm}^2$$

Permissible crushing stress for bolt and key material = 60 N/mm^2

Permissible shear stress for CI = 15 N/mm^2

15. Explain the epicyclic gear train with a neat sketch. Write its advantages and applications.

16. A belt drive is required to transmit 30 kW power. The diameter of the driver pulley is 1·2 m and runs at 190 r.p.m. The angle of lap on smaller pulley is 170° and coefficient of friction is 0·36. Calculate the number of belts required to transfer the given power if each belt is 100 mm wide and 5 mm thick and maximum allowable stress in each belt is 2 N/mm^2.

17. A set of spur gears has to transmit 32 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 120 N/mm^2 and 100 N/mm^2 respectively. The pinion gear has 20 teeth and its face width is 14 times the module. Compute *(a)* module and *(b)* face width.

18. Draw the cam profile for the knife edge follower with uniform velocity. Out stroke 120°, dwell 30°, return stroke 90° and dwell for the remaining period of the cam rotation. Stroke of the follower is 30 mm and minimum of radius of the cam is 25 mm, axis of the follower passes through the axis of the cam shaft.

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