



C09-M-605

3783

BOARD DIPLOMA EXAMINATION, (C-09)

OCT/NOV—2017

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. Define (a) working stress and (b) factor of safety.
2. What size of a hole must be drilled in M34 bolt to make it uniform strength?
3. Define pitch and lead.
4. What types of stresses are induced in shafts?
5. Draw a neat sketch of Gib head key with proportionate dimensions.
6. Two pulleys 400 mm and 800 mm dia which are fixed to two parallel shafts 4 m apart are connected by crossed belt. Find the length of the belt required.
7. Define (a) circular pitch and (b) pressure angle related to gear wheels.
8. Write short notes on flat follower and roller follower.
9. Write the formula for energy stored in a fly wheel and explain the terms in the formula.
10. List three differences between flywheel and governor.

- 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 steam engine has a working pressure of 0.85 N/mm^2 and the effective cylinder diameter is 300 mm. The cylinder is screwed by 10 studs. The allowable tensile stress in the bolts is taken as 22 N/mm^2 .

(a) What is the force exerted on the cylinder cover?

(b) Compute the size of studs to be used.

12. An eye bolt is to be used for lifting a load of 95 kN. Design the bolt if the tensile stress is not to exceed 100 N/mm^2 . Draw a neat proportionate sketch of the bolt.

13. A mild steel shaft transmits 50 kW at 320 r.p.m. Maximum torque transmitted exceeds torque by 25%. Maximum shear stress is 70 N/mm^2 and the angle of twist should not exceed 1° in a length of 20 diameter. Modulus of rigidity (G) is 80 GN/m^2 . Compute the diameter of the shaft.

14. Classify the power transmission chains. Explain the functions and applications of chains.

15. Design a cast iron protective type flange coupling to connect two shafts in order to transmit 10 kW at 480 r.p.m. The following permissible stresses may be used :

Shear stress for shaft, bolt and key material = 40 N/mm^2

Crushing stress for bolt and key = 80 N/mm^2

Shear stress for cast iron = 8 N/mm^2

Draw a neat sketch of the coupling.

16. 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 respectively. The pinion gear has 22 teeth and face width 12 times the module. Compute (i) module and (ii) face width.

17. A belt transmitting ^{*}power from a motor to machine weighs 24 N/m and the maximum permissible tension in it is 1000 N. The angle of contact is spread over $\frac{5}{9}$ of the pulley circumference. Coefficient of friction is 0.28. If the belt runs under maximum power condition, determine the optimum belt speed and maximum power transmitted.
18. A cam is to be designed, for a follower with the following data :
- (i) Outward stroke during 120° of cam rotation
 - (ii) Dwell for the 30° of cam rotation
 - (iii) Return stroke during next 60° of cam rotation
 - (iv) Dwell for the remaining part of the cam rotation

The stroke of the follower is 50 mm. The diameter of the roller is 20 mm, the minimum radius of the cam is 25 mm. The line of stroke of the follower passes through the centre of the cam axis and the outward and return stroke takes place with uniform acceleration and retardation.
