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C16–M–405

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BOARD DIPLOMA EXAMINATION, (C–16)

MARCH/APRIL—2018

DME—FOURTH 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 durability and reliability.

2. Determine the safe tensile load for a bolt of M20, if the safe tensile stress is 80 N/mm^2.

3. Sketch gib-head key with proportionate dimensions.

4. Draw a neat sketch of an open belt and a crossed belt drive. Write the expression for the length of belts in each case. 1½+1½

5. Write any three differences between belt and chain drive.

6. State any two advantages and two applications of epicyclic gear train. 2+1

7. Define bearing and classify bearings according to load application.

8. How do you classify the cams?

9. Draw a simple turning moment diagram for a four-stroke engine.

10. Define *(a)* isochronism and *(b)* stability.

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 steam engine cylinder of 350 mm effective diameter is subjected to a steam pressure of 1·8 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. The 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 bolt not to exceed 100 N/mm^2.

12. A solid shaft is subjected to a bending moment of 3460 kN-mm and a torque of 1150 kN-mm. Determine the diameter of the shaft given the factor of safety as 6 and assuming ultimate bending stress as 690 N/mm^2 and ultimate shear stress as 516 N/mm^2.

13. Design a CI flange coupling to connect two shafts in order to transmit 7·5 kW at 720 r.p.m. The following permissible stresses may be assumed :

Permissible shear stress for shaft, bolt and key material = 33 N/mm^2

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

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

14. A leather belt 120 mm wide and 6 mm thick transmits power from a pulley 750 mm diameter running at 500 r.p.m. taking angle of lap 150°, coefficient of friction 0 3 , mass of the belt as 0·75 kg/m length, the permissible stress as 2·75 MN/m^2. Compute the maximum power that can be transmitted.

15. Explain the following gear trains with neat sketches and state their applications :

(a) Simple gear train

(b) Compound gear train

(c) Reverted gear train

16. Find (a) rubbing velocity, (b) bearing pressure, (c) coefficient of friction and (d) the power lost due to friction in a journal bearing supporting 10 kN load on a 125 mm diameter shaft rotating at 1300 r.p.m. The length of bearing is 1·5 times the shaft diameter. The diametral clearance is 0·15 mm and the absolute viscosity of lubricating oil is 0·01 kg/m-s and k 0 002.

17. Draw the displacement diagram and cam profile to give the following motion to a knife edge follower :

Outward stroke through 40 mm during 120° of cam rotation; Dwell for 60° of cam rotation; return stroke during the next 90°.

Dwell for the remaining part of cam rotation. The minimum radius of cam is 35 mm. The line of stroke of the follower is coinciding with the centre of the cam axis and the follower moves with SHM. The cam is rotating in clockwise direction.

18. *(a)* Explain the porter governor with a neat sketch.

(b) A solid disc flywheel 0·4 m diameter and 100 mm thick is made from cast iron of density 7 10^3 kg/m^3. Determine *(i)* MI of flywheel and *(ii)* KE at 1000 rev/min. 5+5

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