



C09-M-605

3783

BOARD DIPLOMA EXAMINATION, (C-09)

MARCH / APRIL - 2019

DME - VI 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) Answer should be brief and straight to the point.

- 1 Define : $1\frac{1}{2} + 1\frac{1}{2}$
 - (a) Factor of Safety
 - (b) Working stress.
- 2 List various forms of screw threads. **3×1**
- 3 Two machine parts are fastened together tightly by means of **2+1** M28 tap bolt. Calculate the stress that is set up in this bolt by initial tightening.
- 4 Write down the expressions according to Rankine and $1\frac{1}{2} + 1\frac{1}{2}$
Guest theories for the design of shaft subjected to both twisting and bending.

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[Contd...

- 5 A square key has a breadth equal to one-fourth of shaft diameter. The shaft and key are made of same material with compression stress equal to twice the shear stress. Determine the required length of key, in terms of diameter, necessary to transmit the shaft torque. **3**
- 6 State the advantages and disadvantages of gear drive over belt drive. **3×1**
- 7 State the advantages of chain drive compared with belt drive. **3×1**
- 8 Define the following terms : **3×1**
- (a) Cam angle
- (b) Base Circle
- (c) Trace point
- 9 List any three differences between a Fly wheel and a Governor. **3×1**
- 10 Classify the centrifugal governors. **3**

PART - B**10×5=50**

- Instructions :**
- (1) Answer any **FIVE** questions.
- (2) Each question carries **TEN** marks.
- (3) Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.

- 11 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. Determine the size of the bolts so the stress induced in bolt is not to exceed 100 N/mm^2 . **5+5**

- 12 Design a C.I. flange coupling to connect two shafts in order to transmit 10 kW power at 400 rpm. 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 C.I. = 15 N/mm^2 . **4+3+3**
- 13 A mild steel shaft transmits 20 kW power at 200 rpm and is subjected to a bending moment of 560 Nm. The allowable shear stress and tensile or compressive stresses are 42 N/mm^2 and 56 N/mm^2 respectively. Calculate size of the shaft required if it is subjected to gradually applied loads ? **5+5**
- 14 Two pulleys 1.2 m and 0.5 m diameter are on parallel shaft 3.6 m apart, and are connected by a crossed belt drive. The belt has a mass of 0.9 kg/m length, and the maximum tension in it is not to exceed 2000 N. The larger pulley which is the driver runs at 3.5 rev/s and coefficient of friction between belt and pulley is 0.25. Calculate the power transmitted by the belt. **5+5**
- 15 Explain the following gear trains with legible sketches and state their applications : **5+5**
- (a) Compound gear train
 - (b) Reverted gear train
- 16 Design a reverted gear train of four gears to a speed reduction of 12. All gears are to be of same pitch and no gear shall have less than 16 teeth. Sketch the arrangement by showing all the sizes. **6+4**
- 17 Draw the profile of a cam operating a knife edge follower from the following data : **10**
- (1) Lifts the follower through 25 mm during 60 degrees with SHM.
 - (2) The follower remains rest for the next 45 degrees of rotation of the cam.
 - (3) The follower then descends to its original position during 90 degrees rotation of the cam with SHM.

The follower remains at rest for the remaining part of the revolution. The least diameter of the cam is 50 mm, the axis of knife edge follower passes through the axis of the cam shaft.

- 18 (a) List the factors which govern the design of machine part. Explain any of two. **4+6**
- (b) Design and sketch an eye bolt used to lift a load of 60 kN if the stress is not to exceed 100 N/mm².
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