



C14-M-402

4478

BOARD DIPLOMA EXAMINATION, (C-14)
MARCH/APRIL—2018
DME—FOURTH SEMESTER EXAMINATION
DESIGN OF MACHINE ELEMENTS—I

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 'allowable stress' and 'factor of safety'.
2. What are the factors to be considered for the design of machine elements?
3. Determine the safe tensile load for a bolt of M 20 if the safe tensile stress is 100 N/mm².
4. Explain the types of threads used in power screws with neat sketches.
5. Explain the following terms with neat sketches :
(a) Caulking (b) Fullering
6. What are the materials used for shafts?
7. Sketch Gib-head key with proportions.
8. State any three reasons for joining the shafts with couplings.
9. What is the function of bearing? State the main difference between radial bearing and thrust bearing.
10. Explain sliding contact bearings. How are they classified?

- * **Instructions :** (1) Answer *any five* questions.
(2) Each question carries **ten** marks.
(3) Answers should be comprehensive and the criteria for valuation are the content but not the length of the answer.

11. A bolt is subjected to an axial pull of 10 kN and transverse shear force of 5 kN. The yield strength of material is 450 MPa. Considering the factor of safety 3, determine the diameter of bolt using
(a) maximum shear stress theory (b) Maximum distortion energy theory.

12. Design and draw proportionate sketch of an eye bolt to lift a load of 80 kN if tensile stress is not to exceed 460 MPa. Take factor of safety is 5.

13. (a) Explain the following theory of failure :

- (i) Maximum principle stress theory
- (ii) Maximum shear stress theory

(b) A screw-jack carries a load of 5000N. It has a square- threaded single-start screw of pitch 25 mm and 60 mm mean diameter. Calculate the torque to raise the load and efficiency of the screw. Take $\mu = 0.25$.

* **14.** Two plates of 12 mm thick are joined by a double riveted lap joint. The diameter of the rivets is 20 mm and pitch = 80mm. If $\sigma_t = 10 \text{ N/mm}^2$, $\tau = 85 \text{ N/mm}^2$ and $\sigma_c = 140 \text{ N/mm}^2$, determine the efficiency of the riveted joint.

- * 15. Two steel plates 100 mm wide and 12.5 mm thick are to be joined by double lap weld joint. Find the length of the weld if the maximum tensile stress is not to exceed 75 N/mm^2 and maximum tensile load carried by the plates is 100 kN.
16. A line shaft, transmitting a torque of 25 kNm, is supported between the bearings. The supported length is 1.5 m. It is carrying two pulleys weighing 65 kN and 50 kN at a distance of 0.3m and 1.3 m from right support respectively diameter of shaft.
17. Design a muff coupling to connect two shafts transmitting 25 kW at 300 rpm. The shaft and key material are the same having ultimate shear stress of 200 MPa and the ultimate crushing stress is 400 MPa. The ultimate shear stress for the muff material is 100 MPa. The factor of safety for shaft and key is 4. For the muff the factor of safety is 6.
18. A thrust of shaft is taken by 4 collars. The shaft runs at 100 rpm and bears a pressure of 0.5 N/mm^2 . The collar have outer diameter 350 mm and inner diameter 250 mm. Assume $\mu=0.05$. Calculate the power absorbed by friction by using (i) Uniform pressure distribution theory (ii) Uniform wear theory.

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