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Question Paper Code : 21856

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Fifth Semester

Mechanical Engineering

ME 2303/ ME 53/ 10122 ME 504 — DESIGN OF MACHINE ELEMENTS / MACHINE DESIGN

(Common to Fifth Semester, Automobile Engineering and Mechanical and Automation Engineering, Fourth Semester – Manufacturing Engineering, Industrial Engineering and Management and Industrial Engineering)

(Regulations 2008/2010)

(Common to PTME 2303 — Design of Machine Elements for B.E. (Part – Time) Fourth Semester — Mechanical Engineering – Regulations – 2009)

Time : Three hours Maximum : 100 marks

Use of approved data book is permitted.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define 'Factor of safety'.

2. What is impact load?

3. What are the materials used in shafts?

4. In what situation flexible coupling is used?

5. What is preloading of bolts?

6. State the advantages of the welded joints.

7. What is stiffness of spring?

8. What is nipping of leaf spring?

9. Why I section is chosen for the connecting rod of I.C engines?

10. What is full journal bearing?

PART B — (5 × 16 = 80 marks)

11. (a) A machine part is statically loaded and has an yield point strength of 350 N/mm^2. If the principal stresses are 70 N/mm^2 and 35 N/mm^2, both tensile, find the factor of safety for the following cases.

(i) Maximum normal stress theory

(ii) Maximum shear stress theory and

(iii) Distortion energy theory.

Or

(b) An unknown weight falls through 10 mm on to a collar which is rigidly attached to the lower end of a vertical bar 3m long and 600 mm^2 cross section. The maximum instantaneous extension is 2 mm. What is the corresponding stress and the value of the weight. Take E = 200 kN/mm^2.

12. (a) A solid shaft is to transmit 1000 kW at 120 rpm. Find the shaft diameter if the shear stress is 80 N/mm^2. If the shaft is made hollow with internal diameter, find the percentage saving in material. Take I.D = 0.6.

Or

(b) Design a protected type flange coupling for the following requirements.

Power to be transmitted = 10 kW

Speed of the shafts = 960 rpm

Select suitable materials and suitable stresses.

13. (a) A rectangular steel plate 100 mm wide is welded to a vertical plate to form a cantilever with an overlap of 50 mm and an overhang of 150 mm. It carries a vertical downward load of 60 kN at free end. Fillet weld is done three sides of the plate for a permissible stress of 140 N/mm^2. Determine the size of the weld.

Or

(b) A knuckle joint is to transmit a force of 140 kN. Allowable stresses in tension, shear and compression are 75 N/mm^2, 65 N/mm^2 and 140 N/mm^2 respectively. Design the joint.

14. (a) A helical spring is made from a wire of 8 mm diameter and is of outside diameter 75 mm. The spring has 6 numbers of active coils. If the permissible stress in shear is 350 N/mm^2 and the modulus of rigidity is 84 kN/mm^2. Find the axial load, which the spring can take and the deflection produced.

Or

(b) A cast iron flywheel for a blanking press has a mean diameter of 1.5m. The normal operating speed of 275 rpm slows down to 250 rpm during the punching operation. The required energy Fluctuation is 6500 joules and the density of the cast iron is 7000 kg/m^3. Find the area of flywheel rim if the arms and hub provide 7% of the flywheel effect.

15. (a) Design a suitable ball bearing for an axial flow compressor to carry a radial load of 2.5 kN and a thrust load of 1.3 kN. The service imposes a light shock with shock factor 1.5 and bearing will be in use for 35 hours per week for 4 years. The speed of shaft is 900 rpm and diameter of shaft is 45 mm. Assume X = 0.56 and Y = 1.4.

Or

(b) Design a journal bearing for a centrifugal pump with the following data.

Diameter of the journal = 150 mm

Load on bearing = 40 kN

Speed of journal = 900 rpm.
