Reg. No. : | | | | | | | | | | |

A 1457

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2008.

Fifth Semester

Mechanical Engineering

ME 331 — DESIGN OF MACHINE ELEMENTS

Time : Three hours Maximum : 100 marks

Use of approved Data Book is permitted.

Assume appropriate design data wherever required and state them clearly.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Factor of safety.

2. What is stress concentration?

3. Mention the efficiency of any four mechanical transmission elements.

4. List any four types of fits.

5. Sketch a stud.

6. Define Welding.

7. What are the effects of keyways provided on the shaft?

8. What is the use of flywheel?

9. List the uses of springs.

10. What is meant by surge in springs?

PART B — (5 × 16 = 80 marks)

11. (a) Discuss in detail about computer aided design and optimum design. State their relevance in designing mechanical elements. (8 + 8)

Or

(b) A bolt is subjected to a direct tensile load of 25 kN and a shear load of 15 kN. Considering various theories of failure, determine the suitable size of bolt if the yield stress in tension is 250 N/mm². Take F.O.S as 2 and Poisson's ratio as 0.3. (16)

12. (a) Explain the important points to be observed while designing a part for easier machining and heat treating. (16)

Or

(b) Discuss in detail about geometrical tolerances, interchangeable manufacture and selective assembly. (16)

13. (a) A socket type cotter joint is to be designed for a pull of 32 kN. A steel having the following maximum permissible stresses is used.

Permissible stress in tension = 56 N/mm²

Permissible stress in compression = 70 N/mm²

and Permissible stress in shear = 39 N/mm² (16)

Or

(b) Design the joint for welding the bracket B to the column C as shown in figure 1. The safe welding stress in the welds may be taken as 80 N/mm². (16)

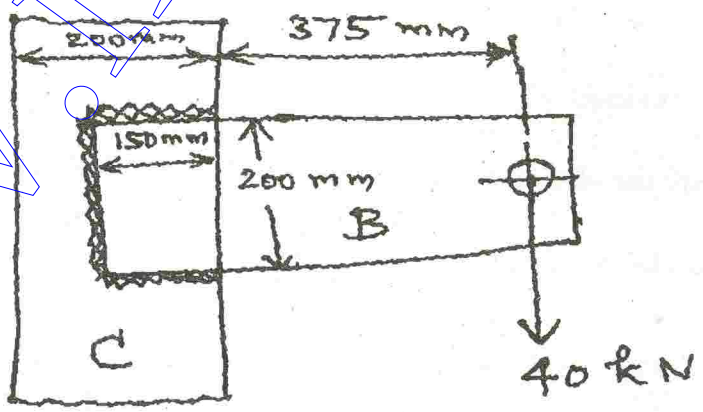

Fig. 1

14. (a) (i) The shaft of an axial flow rotary compressor is subjected to a maximum torque of 2 kNm and a maximum bending moment of a 4 kNm. The combined shear and fatigue factors in torsion and bending may be taken as 1.5 and 2.0 respectively. Determine the diameter of shaft, the shear stress in shaft should not exceed 5.0 MN/m^2. (8)

(ii) Design a hollow shaft for the above compressor taking the ratio inner diameter to outer diameter as 0.5. Calculate the percentage saving in material and compare their stiffness. (8)

Or

(b) During one revolution of the rank of multicylinder engine, the area above and below the mean turning moment line, taken in order are 36,81, 75, 64, 92 and 58 sq.mm. The horizontal scale of diagram is 1 cm = 45° and vertical scale 1 cm = 720 N.m. Find the area of cross-section of the rim of a flywheel required to limit total fluctuation of speed to 3% of mean speed which is 150 rpm. The mean peripheral speed of the rim is 1000 m/min and the density of rim material is 7260 kg/m^3. (16)

15. (a) A helical valve spring is to be designed for an operating load range of approximately 90 to 135 N. The deflection of the spring for the above load range is about 7.5 mm. Assuming severe service and a spring index of 10, determine the size of wire, size and number of coils and pitch recommended. (16)

Or

(b) A load of 10 tonnes is to be supported on 4 leaf springs, each consisting of 10 leaves. The span of each spring is 80 cm and the material of the spring is having permissible tensile stress of 6 N/mm^2 and $E = 2 \times 10^5$ N/mm^2. The maximum deflection allowed is 80 mm. Design and draw the spring. (16)