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B.E / B.Tech-(Full Time) DEGREE END SEMESTER EXAMINATIONS, NOV-DEC 2013

Common to Printing and Manufacturing Engineering Branch

Fourth SEMESTER – (REGULATION 2008)

ME 9261–MACHINE DESIGN

Use of approved design data book permitted.

Time : 3 hr.

Max. Mark :100

Answer ALL Questions

Part A (10 x 2 = 20 Marks)

- 1 List out the factors involved in arriving at factor of safety
- 2 Define stress concentration and stress concentration factor.
- 3 What are the purposes in machinery for which couplings are used?
- 4 What are the factors considered in design of a shaft?
- 5 What is buckling and surge in springs?
- 6 What is nipping of laminated leaf spring?
- 7 What are the required properties of bearing materials?
- 8 What are main considerations involved in the selection of weld type?
- 9 List out the forces acting on the connecting rod.
- 10 What are the various methods of failure in knuckle joint?

PART B (5 x 16 = 80 Marks)

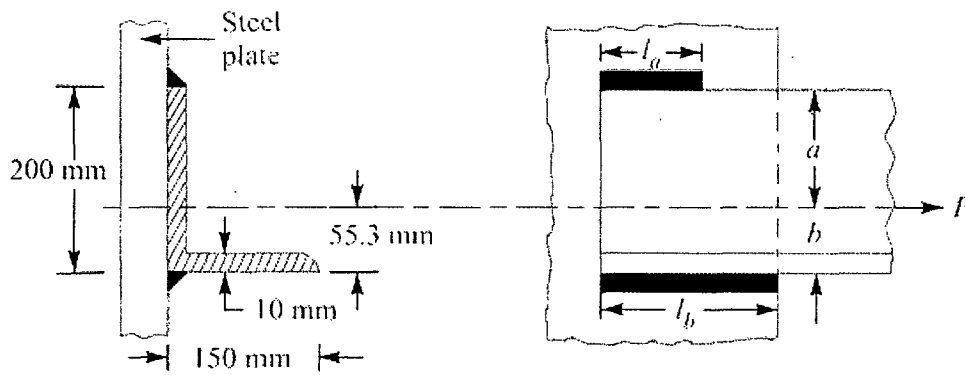
- 11 Determine the maximum stress in the frame of a 50kN punch press as shown in figure below.

- 13a Design a knuckle joint to transmit 150kN. The design stresses may be taken as 75 MPa in tension, 60 MPa in shear and 150 MPa in compression.

(16)

[OR]

- 13b A 200 x 150 x 10 mm angle is to be welded to a steel plate by fillet welds as shown below. If the angle is subjected to a static load of 200kN, find the length of weld at the top and bottom. The allowable shear stress for static loading may be taken as 75 MPa.



(16)

- 14a If an elevator, 24 identical springs having spring index 6 are to be arranged in parallel to absorb the shock due to impact in case of failure. The maximum possible free fall in case of failure of ropes is 15m. The total weight of an elevator is 8.75 kN. The permissible shear stress and modulus of rigidity for spring material are 700 N/mm² and 83 GPa respectively. If maximum permissible compression of each spring in case of free fall is 150 mm, design the springs. Assume under maximum compressed condition, the total clearance between coils is 25% of maximum compression. (16)

[OR]

- 14b A machine with a constant resisting torque is driven by an IC engine. The torque developed by the engine is given by an expression : $T=4000+1500 \sin\theta+4000 \sin2\theta$ Nm. A rimmed flywheel made of grey cast iron ($\rho=7000\text{kg/m}^3$) is used to maintain speed of the engine between 200 rpm and 210 rpm. The rim contributes 90% of the

required mass moment of inertia. A maximum diameter of the flywheel is limited to 2.1 m. If the factor of safety is 7.5, design the flywheel. Neglect the effect of restraint of arm on the flywheel rim. Take ultimate tensile strength of the grey cast material as 150 MPa. (16)

15a A sleeve bearing is 10mm in diameter and 10 mm long. SAE 10 oil at an inlet temperature 50 degree Celsius is used to lubricate the bearing. The radial clearance is 0.0076 mm. If the journal speed is 3600 rpm and the radial load on the bearing is 68 N, find the temperature rise of the lubricant and the minimum film thickness. (16)

[OR]

15b Select a suitable deep groove ball bearing for supporting a radial load of 10kN and an axial load of 3kN for a life of 4000 hours at 800 rpm. Select from series SKF 63. Calculate the expected life of the selected bearing. (16)