Code No. : 5191

FACULTY OF ENGINEERING
B.E. 3/4 (M/P) II Semester (Suppl.) Examination, January 2012
MACHINE DESIGN

Time: 3 Hours] [Max. Marks: 75

Note : *Answer* ***all*** *questions from Part* ***A****, answer* ***any five*** *questions from Part* ***B****. Missing data,* ***if any*** *may suitably* ***assumed****.*

PART – A **(10×2$^{1}/_{2}$=25 Marks)**

1. Classify different types of springs. Give one example for each.
2. How the surge in the springs is eliminated ?
3. Differentiate between cycloidal and involute tooth profiles used in gears.
4. Discuss different types of gear tooth failures.
5. Distinguish between "Hydro-dynamic bearings" and "Hydro-static bearings".
6. Define the terms "Bearing modulus" and "Sommerfeld number".
7. State the function of piston pin, piston skirt and piston rings in an I.C. engine.
8. What is interference angle between valve seat and valve seating surface ? Why it is provided ?
9. What are the factors to be considered while designing crane hook ?
10. Briefly discuss the difference in analysis between straight beam and curved beam.

PART – B **(5×10=50 Marks)**

11. A semi-elliptical laminated spring is to carry a load of 5000 N and consists 8 leaves 46 mm wide, two of the leaves being of full length. The spring is to be made 1000 mm between the eyes and is held at the centre by a 60 mm wide band. Assume that the spring is initially stressed so as to induce an equal stress of 500 N/mm^2 when fully loaded. Design the spring giving

    a) thickness of leaves b) eye diameter c) length of leaves

    d) maximum deflection and camber. Assume $^{1}E = 2.1 \times 10^{6}$ N/mm^2.

12. A spring is made source wire of 1.25 mm diameter and 750 N/mm^2 as its yield strength. For a mean diameter of 12.5 mm and 14 active coils of the spring, determine

    a) static load corresponding to the yield point of the material and deflection corresponding to that

    b) solid height assuming that the ends are squared and ground

    c) stiffness of spring

    d) pitch of the wire so that the solid stress will not exceed the yield point. Take $C = 0.85 \times 10^5$ N/mm^2.

13. Determine the proper pitch, module, face, number of teeth and outside diameters of a pair of 20° involute full depth spur gears to transmit 112.5 kW, from a pinion running at 750 rev/min to a gear running at 140 rev/min. The service is intermittent with light shocks.

14. Design a pair of equal diameter, 20° stub tooth helical gears to transmit 37.5 kW with moderate shock at 1200 rev/min. The two shafts are parallel and 0.45 m apart. Each gear is to be of steel. FInd the module and face width of the teeth.

15. A full journal bearing of 0% m diameter by 0.15 m long supports a radial load of 5500 N. The shaft speed is 500 rev/min. The room temperature is 32°C and the surface of the bearing is to be limited to 63°C. Select a suitable oil to satisfy the above requirements, if the bearing is well ventilated and no artificial cooling is to be used. Assume D/cd = 1000.

16. Design an overhung crank shaft with two main bearings and a flywheel in between them for an I.C. engine, single cylinder 0.25 m × 0.30 m. The flywheel weighs 27 kN. The maximum pressure is 2.1 MPa. The torsional moment is maximum when the crank is at 35° from the I.D.C., while the pressure is 1.05 MPa. Assume missing data.

17. The bed diameter of a crane hook is 95 mm. The section of the hook is trapezoidal with depth equal to 190 mm. The width of the section at the larger end is 125 mm and at the smaller end is 89 mm. The load on the hook is 135 kN. Determine the maximum unit stresses in tension and compression.