Code No.: 6341

FACULTY OF ENGINEERING

B.E (III/IV Year) (Mech/Prod) II Semester (Main) Examination, June 2010

MACHINE DESIGN

Time : 3 Hours] [Max. Marks : 75

Answer **all** *questions* Part A.
Answer **five** *questions from* Part B.

Part A – (25 Marks)

1. Briefly discuss the importance of A.M Wahl's factor in the design of helical springs.
2. What is shot peening? Discuss its role in improving the fatigue strength of a spring wire.
3. Classify different types of gears.
4. List the different types of gear tooth failures.
5. What is meant by "self contained bearings"?
6. Give the applications and limitations of rolling contact bearings.
7. What are the methods and materials used in the manufacture of crank shafts?
8. What is the function of a valve spring in an I.C. engine?
9. Mention the factors to be considered while designing C- clamps.
10. Briefly discuss the effect of initial curvature on the analysis of theory of bending of beams.

Part B – (50 Marks)

11. A helical- compression spring of a cam – mechanism is subjected to an initial preload of 50N. The maximum operationg force during the load cycle is 150N. The wire diameter is 3mm, while the mean coil diameter is 18mm. The spring is made of oil–hardened and tempered valve spring wire of grade VW (Sut= 1430 N/mm^2). Determine the factor of safety used in the design.

12. A truck spring has 12 number of leaves, two of which are full length leaves. The spring supports are 1.05m apart and the central band is 85mm wide. The central load is to be 5.4 KN with a permissible stress of 280 MPa. Determine the thickness and width of the steel spring leaves. The ratio of the total depth to the width of the spring is 3. Also determine the deflection of the spring.

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13. It is required to design a pair of spur gears with 20° full- depth involute teeth based on Lewis equation. The velocity factor is to be used to account for dynamic load. The pinion shaft is connected to a 10kW, 1440 r.p.m motor. The starting torque of the motor is 150% of the rated torque. The speed reduction is 4:1. The pinion as well as the gear are made of plain carbon steel 40 C 8 (Sut= 600N/mm^2). The factor of safety can be taken as 1.5. Design the gears, specify their dimensions and suggest suitable surface hardness for the gears.

14. A pair of straight bevel gears has a velocity ratio of 2:1. The pitch circle diameter of the pinion is 80mm at the large end of the tooth. A 5kW power is supplied to the pinion, which rotates at 800 r.p.m. The face width is 40mm and the pressure angle is 20°. Calculate the tangential, radial and axial components of the resultant tooth force acting on the pinion.

15. A ball bearing subjected to a radial load of 3000N is expected to have a satisfactory life of 10000 hrs at 720 r.p.m with a reliability of 95%. Calculate the dynamic load carrying capacity of the bearing, so that it can be selected from a manufacturer's catalogue based on 90% reliability. If there are four such bearings each with a reliability of 95% in a system, what is the reliability of the complete system?

16. Design a connecting rod for a single cylinder four stroke diesel engine with following specifications:
Power = 7.5kW, Mechanical Efficiency= 80%, weight of reciprocating parts= 20N, Length of connecting rod= 0.30m, Speed= 1500 rev/min with a possible over speed of 2500 rev/min. Assume suitable missing data.

17. Design a crane hook with the useful load lifting capacity of the crane as 100kW. The weight of the hook is 20kN.