

FACULTY OF ENGINEERING

B.E. 3/4 (Automobile Engg.) II Semester (Main) Examination, April / May 2013

Subject: Design of Automotive Components

Time: 3 Hours

Max.Marks: 75

*Note : Answer all questions from Part A. Answer any Five questions from Part B.***PART – A** (10x2.5 = 25 Marks)

1. Explain the various types of cylinder liners.
2. What is meant by whipping of a connecting rod and what is its effect?
3. Name the possible modes of failure to be considered for the design of
(a) Piston pin and (b) Crank pin.
4. Briefly explain about nipping of leaf springs.
5. Define the terms pitch circle, pressure angle and backlash as applicable to spur gears.
6. List out the advantages of worm gearing.
7. Sketch a semi elliptical leaf spring assembly and identify various parts in it.
8. Define “coefficient of fluctuation of speed” and “coefficient of steadiness”.
9. Explain the following terms as applied to rolling contacts bearings.
(a) Static load carrying capacity
(b) Dynamic load carrying capacity.
10. What are ‘Lewis’ and ‘Buckingham’ equations?

PART – B (5x10 = 50 Marks)

11. Design a cast iron piston for single acting four stroke engine for the following specifications:
Cylinder bore = 100 mm; Stroke = 120 mm, Maximum gas pressure = 5 N/mm²;
Break mean effective pressure = 0.65 N/mm²; Fuel Consumption = 0.23 Kg/KW/hr
Speed = 2200 rpm.
12. A single cylinder double acting steam engine develops 150 KW at a mean speed of 80 rpm. The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is $\pm 2\%$ of the mean speed. If the mean diameter of the fly wheel rim is 2 meters and the hub and spokes provide 5 percent of the rotational inertia of the fly wheel, find the mass of the fly wheel and cross-sectional area of the rim. Assume the density of the flywheel material as 7200 Kg/m³.
13. A semi-elliptical truck spring has 12 leaves, of which two are full length leaves. The spring supports are 0.7m apart. The width of the central band is 80 mm, and the load on the spring is 20 kN. The permissible stress is 460 MPa. The ratio of the total depth to width of the spring is 3. Determine the thickness and width of the spring leaves. Also, determine the deflection of the spring. Assume that the extra full length leaf is not pre-stressed. Take $E = 2.1 \times 10^5$ MPa.
14. A bronze spur pinion rotating at 600 rpm drives a cast iron spur gear at a transmission ratio of 4:1. The allowable static stresses for the bronze pinion and cast iron gear are 84 MPa and 105 MPa respectively. The pinion has 16 standard 20° full depth involute teeth of module 8 mm. The face width of both the gears is 90 mm. Find the power that can be transmitted from the stand point of strength.

15. A bearing, 50 mm in diameter and 75 mm in length, supports a over hanging shaft, running at 900 rpm. The room temperature is 30°C, and the bearing temperature is 75°C. The viscosity of the oil used is 0.012 Kg/m-sec. at the operating temperature of 120°C. The diametral clearance is 0.05 mm, and the bearing is to operate in still air, without any artificial cooling. Determine (i) the permissible load on the bearing, and (ii) power loss.
16. A ball bearing is operating on a work cycle consists of three parts as follows. A radial load of 2500 N at 1200 rpm for one quarter cycle. A radial load of 4500 N at 900 rpm for one half cycle and radial load of 2000N at 1440 rpm for the remaining cycle. The expected life of the bearing is 12000 hr. Calculate the dynamic load carrying capacity of the bearing.
17. A spring is subjected to a variable load, varying from 500 N to 900 N. Determine the diameter of wire and mean diameter of the coils. Take factor of safety as 1.5. Assume the other suitable data.
