

FACULTY OF ENGINEERING

B. E. 3/4 (Mech./Prod.) II-Semester (Old) Examination,
December 2009 / January 2010

Subject : **Mechine Design**

Time : 3 Hours

Max. Marks: 75

Note: Answer all questions from Part-A. Answer any Five questions from Part-B.

Part – A (25 Marks)

1. What is the significance of Wahl's factor?
2. What is Whipping stress?
3. Give expressions for static and limiting wear loads for a helical gear.
4. Write the expression for frictional torque transmitted in conical pivot bearing.
5. Explain any one method of bearing mounting.
6. Explain the details of the SKF designation of bearing 6108.
7. Explain the classification of piston rings.
8. To make a worm drive reversible, it is necessary to increase
A) Centre distance B) Worm diameter factor
C) Number of starts D) Reduction ratio
9. Explain the materials used for the followings :
a) leaf springs b) connecting rod
10. Explain load-life relationship for rolling contact bearings.

Part – B (50 Marks)

11. A truck with a weight of 20 kN is moving with a velocity of 1.5 m/sec. It is brought to rest by a bumper consisting of two parallel helical springs with spring index as 6. The springs are brought to rest with a compression of 22 cm. Find the suitable diameter of spring wire, the mean coil diameter and the active number of coils.
Take permissible $f_s = 36 \text{ kN/cm}^2$ and $G = 8 \times 10^4 \text{ MPa}$ service factor may be taken as 1.2.
12. Design a leaf spring for the following specifications :
Total load = 140 kN : No. of springs supporting the load = 4;
Max. No. of leaves = 10 ;
Span of the spring = 1000 mm;
Permissible deflection = 80 mm
Take young's modulus, $E = 200 \text{ kN/mm}^2$ and allowable stress in spring Material as 600 MPa.

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13. A pair of Bevel gears is required to transmit 12 KW power at 500 rpm from a motor shaft to a machine shaft. The speed reduction is 4 : 1 and shafts are inclined at 60° . The pinion is to have 24 teeth with pressure angle 20° and is made of cast iron gear with static stress of 55 N/mm^2 . The pinion is mounted mid way on the shaft which is supported between two bearings having span of 200mm. Design the gear pair.
14. A motor shaft rotating at 1500 r.p.m. has to transmit 15 KW to a low speed Shaft with a speed reduction of 3 : 1. The teeth are $14\frac{1}{2}^\circ$ involute with 25 teeth on the pinion. Both the pinion and gear are made of steel with a max. Safe stress of 200 MPa. A safe stress of 40 MPa may be taken for the shaft on which the gear is mounted and for the key. Design a spur gear drive to suit the above conditions. Assume starting torque to be 25 % higher than the running torque.
15. Design a deep groove ball bearing to support a vertical shaft for the following data : Radial load = 750 kg; axial load = 220 kg; desired life = 160×10^6 revolutions speed = 300 rpm.
16. Design a trunk type piston for a single cylinder four stroke diesel engine running at 1000 rpm.
17. Write down the detail procedure for the design of crane hook of triangular section for a given load.
