

GUJARAT TECHNOLOGICAL UNIVERSITY
PDDC - SEMESTER-VIII • EXAMINATION – SUMMER • 2014

Subject Code: X 81902**Date: 29-05-2014****Subject Name: Machine Design-II****Time: 10:30 a.m. To 01:00 p.m.****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of STANDARD DESIGN DATA BOOK is permissible.

- Q.1** (a) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. **07**
- (b) 1) Why an I-section is usually preferred to round section in case of connecting rods? **07**
2) What are the merits and demerits of wet and dry cylinder liners?
- Q.2** (a) Why trapezoidal section is used for hook? Draw a neat sketch of single hook and show the critical section on it. **07**
- (b) Explain Wire ropes with its designation. What are the advantages of wire ropes. Explain selection of wire ropes. **07**
- OR**
- (b) Classify the conveyors. Explain construction and working of any one conveyor. **07**
- Q.3** Design a connecting rod for a 4 – stroke petrol engine from the following data: **14**
Cylinder bore = 100 mm
Stroke length = 140 mm
Engine speed = 1500 rpm
Possible over speed of engine = 2500 rpm
Maximum explosion pressure = 2.5 MPa
Weight of reciprocating parts = 18.5 N
Length of connecting rod = 315 mm
Yield strength of connecting rod material = 320 MPa
Factor of safety = 5
Permissible bearing pressure for big end = 12.5 MPa
Permissible bearing pressure for small end = 15 MPa
- OR**
- Q.3** Draw speed ray diagram and layout for a six speed gear box .The out put speed are 160 r.p.m. minimum and 1000 r.p.m. maximum. The motor speed is 1440 r.p.m. **14**
- Q.4** (a) The following data is given for a pair of helical gears made of steel **09**
- Normal module = 5mm
 - Face width = 50mm
 - Number of pinion teeth = 30
 - Number of gear teeth = 60
 - Center distance = 245mm
 - Normal pressure angle = 20°
 - Pinion speed = 100r.p.m
 - Permissible bending stress for pinion and gear material = 150N/mm^2
 - Surface hardness = 300BHN
 - Factor of safety = 2

- Service factor = 1.5
- Grade of machining = 8

Determine:-

1. The helix angle;
2. The beam strength;
3. The wear strength;
4. The max. static load the gears can transmit; and
5. The power transmitting capacity.

Assume velocity factor $K_v = \sqrt{\frac{5.6}{5.6 + \sqrt{V}}}$ accounts for dynamic load.

Use the following data:

$$K = 0.16 \left[\frac{BHN}{100} \right]^2 \text{ N/mm}^2$$

Z	30	38	43	50	60	75	100
Y	0.3707	0.3833	0.3958	0.4084	0.4210	0.4335	0.4461

- (b) With the help of neat sketch, state and explain the components of force acting on helical gear tooth. **05**

OR

- Q.4 (a)** A triple-start worm rotating at 1440r.p.m. transmits 5kW power to a worm gear rotating at 72r.p.m. The pitch circle diameter of worm is 60mm and axial module is 6mm. The tooth system is 20° stub-involute, while the co-efficient of friction between worm and worm gear tooth is 0.1. If the worm is left hand type, determine: **09**

1. The components of tooth force acting on the worm and worm gear; and
2. The efficiency of worm gear pair.

- (b) What are the different modes of worm gear tooth failure? State their causes and remedies. **05**

- Q.5 (a)** What are the guidelines in selecting material handling equipment **07**

- (b) Design a crane hook for lifting capacity 49.05kN. Take permissible tensile stress 80 N/mm^2 for forged steel. **07**

OR

- Q.5** Design the crank pin and the crank of a side crankshaft for a 500mm X 600mm four stroke gas engine. The weight of the flywheel is 85000N and it is mounted mid-way between two bearings. Explosion pressure is 2.5 N/mm^2 gauge. At maximum torque, when the crank angle is 36° , the gas pressure is 0.93 N/mm^2 gauge, the connecting rod length is 4.75 times the radius of the crank. Select all other dimensions and stresses for material used. Design the journals and find the diameter of the shaft under the flywheel. Assume that the flywheel is used as a pulley and the sum of tensions in two sides of the belt, which is horizontal, is 5,90,000N. The length of the shaft under the flywheel is 500mm. **14**

Assume the allowable stresses are:

For open hearth steel tensile stress 70 to 85 N/mm^2

Allowable bending stress 55 N/mm^2
