

GUJARAT TECHNOLOGICAL UNIVERSITY
BE SEMESTER- VI • EXAMINATION – Summer 2015

Subject Code:160201**Date:01/05/2015****Subject Name: Automobile Component Design****Time:10.30AM-01.00PM****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) Differentiate between dry and wet liner. Describe the Ideal properties required for engine Piston material. **07**
- (b) What do you mean of creep? Explain Hot Working Process. **07**

- Q.2** (a) A ball bearing is operating on a work cycle consisting of three parts-a radial load of 3000 N at 1440 rpm for one quarter cycle, a radial load of 5000 N at 720 rpm for one half cycle, and radial load of 2000N at 1200 rpm for the remaining cycle. The expected life of the bearing is 10000 h. Calculate the dynamic load carrying capacity of bearing. **07**
- (b) Explain Balancing of single & multi cylinder engine. **07**

OR

- (b) State and explain design consideration of casting and Forging. **07**
- Q.3** (a) Define below terms for Spur Gear **07**
 (i) Pitch circle (ii) Pressure angle (iii) Module (iv) Backlash
 (v) Path of contact (vi) Addendum (vii) Arc of contact
- (b) A pair of straight teeth spur gears is to transmit 20kW when the pinion rotates at 300 rpm. The velocity ratio is 1:3 .The allowable static for the pinion and gear materials are 120MPa and 100 MPa respectively. The pinion has 15 teeth and its face width is 14 times the module. **07**

Determine: (1) module; (2)face width; (3)Pitch circle diameters of both the pinion and gear from the standpoint of strength only, taking into consideration the effect of the dynamic loading. Taking $C_s = 1$

The tooth form factor y can be taken as

$$y = 0.154 - \frac{0.912}{\text{No of teeth}}$$

And the velocity factor C_v

$$C_v = \frac{3}{3+v}, \text{ Where } v \text{ is expressed in m/s.}$$

OR

- Q.3** (a) Explain types of worm gears & Efficiency of worm gears. **07**
- (b) A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80 mm and 100 mm respectively. The tooth profiles of the gears are of $14 \frac{1}{2}^\circ$ composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75 kW at 1100 r.p.m., find the module and number of teeth on each gear from the standpoint of strength and check the design from the standpoint of wear. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84 kN/mm^2 . **07**
- Tooth factor

$$y = 0.124 - \frac{0.684}{\text{No of teeth}}$$

- Q.4 (a)** Explain selection of proper gear ratios for an automobile gearbox. Explain Function of flywheel. **07**
- (b)** A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 40 teeth gear. The helix angle is 25° and the normal pressure angle is 20° . The normal module is 3 mm. Calculate (i) Transverse module (ii) Transverse pressure angle (iii) axial pitch (iv) pitch circle diameters of pinion and gear (v) centre distance (vi) addendum and dedendum circle diameters of the pinion. **07**
- OR**
- Q.4 (a)** Give Different types of forces acting on connecting rod. Explain any two forces with diagram. **07**
- (b)** A four stroke diesel engine has the following specifications : **07**
 Brake power = 5 kW ; Speed = 1200 r.p.m. ;
 Indicated mean effective pressure = 0.35 N / mm²;
 Mechanical efficiency = 80 %.
 Taking a clearance on both sides of the cylinder is 15%
 Determine : (1) bore and length of the cylinder ; (2) thickness of the cylinder head ; and (3) size of studs for the cylinder head.
- Q.5 (a)** Classify Rolling contact Bearings with neat sketch. Also Define following (1) Life of Bearing (2) Reliability of Bearing **07**
- (b)** Design a cast iron piston for a single acting four stroke engine for the following data **07**
 Cylinder bore = 100 mm ; Stroke = 125 mm ;
 Maximum gas pressure = 5 N/mm² ;
 Indicated mean effective pressure = 0.75 N/mm² ;
 Mechanical efficiency = 80% ;
 Fuel consumption = 0.15 kg per brake power per hour ;
 Higher calorific value of fuel = 42×10^3 kJ/kg ;
 Speed = 2000 r.p.m.
 For cast iron $k = 46.6 \text{ W/m}^{\circ}\text{C}$
 $T_c - T_E = 220^{\circ}\text{C}$
 Any other data required for the design may be assumed
 Determine (i) Piston Crown (ii) Piston rings (iii) Piston barrel
- OR**
- Q.5 (a)** Explain the working of valve gear mechanism for a given I.C. engine with neat sketch. **07**
- (b)** What is the difference between centre and overhung crankshafts? Where do you use them? Name the materials for crankshaft. **07**
