

Seat No.: \_\_\_\_\_

Enrolment No. \_\_\_\_\_

**GUJARAT TECHNOLOGICAL UNIVERSITY**

**BE - SEMESTER-VI(OLD) – EXAMINATION – SUMMER 2019**

**Subject Code:160201**

**Date:27/05/2019**

**Subject Name: Automobile Component Design**

**Time:10:30 AM TO 01:00 PM**

**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) Explain the working of valve gear mechanism for a given I.C. engine with neat sketch. **07**
- (b) A helical cast steel gear with  $30^\circ$  helix angle has to transmit 35 kW at 1500 r.p.m. **07**  
If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for  $20^\circ$  full depth teeth. The static stress for cast steel may be taken as 56 MPa. The width of face may be taken as 3 times the normal pitch. What would be the end thrust on the gear? The tooth factor for  $20^\circ$  full depth involute gear may be taken as  $0.154 - \frac{0.0912}{T_E}$ , where  $T_E$  represents the equivalent number of teeth.

- Q.2** (a) Explain the designing procedure of multi speed automobile gear box **07**
- (b) A bronze spur pinion rotating at 600 r.p.m. 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  $20^\circ$  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 standpoint of strength. **07**

**OR**

- (b) A shaft rotating at constant speed is subjected to variable load. The bearings supporting the shaft are subjected to stationary equivalent radial load of 3 kN for 10 per cent of time, 2 kN for 20 per cent of time, 1 kN for 30 per cent of time and no load for remaining time of cycle. If the total life expected for the bearing is  $20 \times 10^6$  revolutions at 95 per cent reliability, calculate dynamic load rating of the ball bearing. **07**
- Q.3** (a) Explain the following terms in relation with rolling contact bearing **07**  
1) Equivalent load, 2) Bearing life.
- (b) A four stroke diesel engine has the following specifications : **07**  
Brake power = 5 kW ; Speed = 1200 r.p.m. ; Indicated mean effective pressure =  $0.35 \text{ N/mm}^2$  ; Mechanical efficiency = 80 %.  
Determine: 1. bore and length of the cylinder ; 2. thickness of the cylinder head ; and 3. size of studs for the cylinder head.

**OR**

- Q.3** (a) Determine the beam strength and face width of helical gears, also explain the following 1) Helix angle 2) Axial pitch 3) Normal Pitch **07**
- (b) Design a cast iron piston for a single acting four stroke engine for the following **07**  
data:  
Cylinder bore = 100 mm ; Stroke = 125 mm ; Maximum gas pressure =  $5 \text{ N/mm}^2$  ; Indicated mean effective pressure =  $0.75 \text{ N/mm}^2$  ; Mechanical efficiency = 80% ; Fuel consumption = 0.15 kg per brake power per hour ; Higher calorific value of fuel =  $42 \times 10^3 \text{ kJ/kg}$  ; Speed = 2000 r.p.m.

Any other data required for the design may be assumed. Design a only following part

- 1) Piston head or crown
- 2) Piston rings
- 3) Piston skirt
- 4) Piston pin

- Q.4 (a)** Explain strength rating and wear rating of worm gears **07**  
**(b)** Design of the crankshaft when the crank is at the dead centre for the following **07**

data

:Bore = 400 mm ; Stroke = 600 mm ; Engine speed = 200 r.p.m. ; Mean effective pressure = 0.5 N/mm<sup>2</sup>; Maximum combustion pressure = 2.5 N/mm<sup>2</sup>; Weight of flywheel used as a pulley = 50 kN; Total belt pull = 6.5 kN. When the crank has turned through 35° from the top dead centre, the pressure on the piston is 1N/mm<sup>2</sup> and the torque on the crank is maximum. The ratio of the connecting rod length to the crank radius is 5. Assume any other data required for the design.

**OR**

- Q.4 (a)** Explain Design Criteria of intake manifold and exhaust manifold **07**  
**(b)** A side or overhung crankshaft for a 250 mm × 300 mm gas engine. The **07**  
weight of the flywheel is 30 kN and the explosion pressure is 2.1 N/mm<sup>2</sup>. The gas pressure at the maximum torque is 0.9 N/mm<sup>2</sup>, when the crank angle is 35° from I. D. C. The connecting rod is 4.5 times the crank radius. Design of crankshaft when the crank is at the dead centre

- Q.5 (a)** Discuss causes of failure in rolling contact bearing. **07**  
**(b)** Explain types of worm gears & Efficiency of worm gears. **07**

**OR**

- Q.5 (a)** What do you mean of creep? Explain Hot Working Process **07**  
**(b)** Differentiate between dry and wet liner. Describe the Ideal properties required for engine **07**  
Piston material

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