

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI (OLD) - EXAMINATION – SUMMER 2018

Subject Code:160201

Date:10/05/2018

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) 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 Piston material **07**

- Q.2** (a) Explain Load distribution on balls (stribeck's equation). **07**
(b) Design a journal bearing for a centrifugal pump from the following data: Load on the journal = 20 000 N; Speed of the journal = 900 r.p.m.; Type of oil is SAE 10, for which the absolute viscosity at 55°C = 0.017 kg / m-s; Ambient temperature of oil = 15.5°C ; Maximum bearing pressure for the pump = 1.5 N / mm². Calculate also mass of the lubricating oil required for artificial cooling, if rise of temperature of oil be limited to 10°C. Heat dissipation coefficient = 1232 W/m²/°C. **07**

OR

- (b) The rolling contact ball bearing is to be selected to support the overhung countershaft. The shaft speed is 720 r.p.m. The bearings are to have 99% reliability corresponding to a life of 24 000 hours. The bearing is subjected to an equivalent radial load of 1 kN. Consider life adjustment factors for operating condition and material as 0.9 and 0.85 respectively. Find the basic dynamic load rating of the bearing from manufacturer's catalogue, specified at 90% reliability **07**

- Q.3** (a) Discuss the procedure for designing multispeed gearbox. **07**
(b) A pair of straight teeth spur gears, having 20° involute full depth teeth is to transmit 12 kW at 300 r.p.m. of the pinion. The speed ratio is 3: 1. The allowable static stresses for gear of cast iron and pinion of steel are 60 MPa and 105 MPa respectively. Assume the following: Number of teeth of pinion = 16; Face width = 14 times module; Velocity factor (C_v) = 4.5 / (4.5 + v), v being the pitch line velocity in m / s; and tooth form factor (y) = 0.154 – 0.912 / No. of teeth. Determine the module, face width and pitch diameter of gears. Check the gears for wear; given σ_{es} = 600 MPa; EP = 200 kN/mm² and EG = 100 kN/mm². Sketch the gears. **07**

OR

- Q.3** (a) Explain different modes of gear teeth failures, stating their reasons and remedies. **07**
(b) A helical cast steel gear with 30° helix angle has to transmit 35 kW at 1500 r.p.m. If the gear has 24 teeth, determine the necessary module, pitch diameter and face width for 20° 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° full depth involute gear may be taken as 0.0154 – 0.192 / T_E. Where T_E represents the equivalent number of teeth. **07**

- Q.4** (a) What are the functions of piston rings? **07**
(b) A four stroke diesel engine has the following specifications: Brake power = 5 kW; Speed = 1200 r.p.m. ; Indicated mean effective pressure = 0.35 N / mm² ; 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. **07**

OR

- Q.4** (a) Explain the working of valve gear mechanism for a given I.C. engine with neat sketch. **07**
(b) The conical valve of an I.C. engine is 60 mm in diameter and is subjected to a maximum gas pressure of 4 N/mm². The safe stress in bending for the valve material is 46 MPa. The valve is made of steel for which $k = 0.42$. The angle at which the valve disc seat is tapered is 30°. Determine : 1. thickness of the valve head ; 2. stem diameter ; and 3. maximum lift of the valve **07**

- Q.5** (a) Explain design consideration of piston and selection of piston material in I C engine **07**
(b) Explain design procedure for connecting rod **07**

OR

- Q.5** (a) Explain advantages and disadvantages of helical gears over the spur gear. **07**
(b) Differentiate between involutes and cycloid profile of the gears. **07**

.....