

GUJARAT TECHNOLOGICAL UNIVERSITY**BE - SEMESTER-VI- EXAMINATION – SUMMER 2016****Subject Code:160201****Date:19/05/2016****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 general consideration in Machine Design. Discuss the selection of materials for engineering purposes. **07**
- (b) Explain Load distribution on balls (stribek's equation). **07**
- Q.2** (a) A helical cast steel gear with 30° helix angle has to transmit 30 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 58 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 $(0.154 - 0.912/T_E)$ where T_E represents the equivalent number of teeth. **07**
- (b) What do you mean of creep? Explain Hot Working Process. **07**
- OR**
- (b) Discuss the design considerations for casting **07**
- Q.3** (a) Define below terms for Spur Gear (i) Pitch circle (ii) Pressure angle (iii) Module (iv) Backlash (v) Path of contact (vi) Addendum (vii) Arc of contact **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° 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**
- Q.3** (a) Discuss the procedure for designing multispeed gearbox **07**
- (b) What are the advantages and disadvantages of "Wet Liner" and "Dry Liner" in I.C. engines? What are the desirable properties of cylinder materials? **07**
- Q.4** (a) Classify Rolling contact Bearings with neat sketch. Also Define following (1) Life of Bearing (2) Reliability of Bearing **06**
- (b) Design a cast iron piston for a single acting four stroke engine for the following data: Cylinder bore = 100mm; Stroke = 125mm; Maximum gas pressure = 5N/mm^2 Indicated Mean effective pressure = 0.755N/mm^2 ; Mechanical efficiency = 80%; Fuel consumption = 0.15kg per brake power per hour; Higher calorific value of fuel = 42×10^3 KJ/kg; Speed = 2000r.p.m. Taking Permissible bending or tensile stress for C.I = 38N/mm^2 ; C = Constant representing that portion of the heat supplied to the engine which is absorbed by the piston is 0.05. cast iron , Heat conductivity factor $k = 46.6$ W/m $^\circ\text{C}$, and Temperature difference at the centre of the piston head and temperature at the edges piston head is = 220°C ; Pressure of the gas on cylinder wall is 0.035; Allowable tensile or bending stress for C.I ring is 90N/mm^2 ; Bearing pressure on the piston barrel is 0.45 N/mm 2 Bearing pressure at small end of connecting rod is 25 N/mm 2 Bending stress for piston pin is 140N/mm^2 **08**
- OR**
- Q.4** (a) A ball bearing subjected to radial load of 5KN is expected to have a life of 8000hr at 150 r.p.m. with a reliability of 99%. Calculate the dynamic load capacity of the bearing, so that it can be selected from the manufacturer catalogue based on a reliability of 90% **07**

- (b) Four stroke diesel engine has following specifications: Brake Power = 5kw; Speed = 1200r.p.m; Indicated mean effective pressure = 0.38N/mm² ; Mechanical efficiency = 80%. Length of stroke $l = 1.5D$; Clearance on both the side of cylinder = 15%; Maximum pressure in the engine cylinder is 9 times mean effective pressure; Cylinder head constant = 0.1; Allowable stress for cylinder head = 42N/mm² ; Core diameter of stud = 0.83x Nominal diameter of studs; Tensile stress for material of studs = 65N/mm² ; Determine 1). Bore and length of cylinder; 2) Thickness of cylinder head; 3) Size of studs for the cylinder head. **07**

- Q.5** (a) Explain different modes of gear teeth failures, stating their reasons and remedies **07**
(b) Explain the working of valve gear mechanism for a given I.C. engine with neat sketch **07**

OR

- Q.5** (a) Design a connecting rod for an I.C. engine running at 1500 r.p.m. and developing a maximum pressure of 3.15 N/mm². The diameter of the piston is 100 mm ; mass of the reciprocating parts per cylinder 2.25 kg; length of connecting rod 380 mm; stroke of piston 190 mm and compression ratio 6 : 1. Take a factor of safety of 6 for the design. Take length to diameter ratio for big end bearing as 1.3 and small end bearing as 2 and the corresponding bearing pressures as 10 N/mm² and 15 N/mm². The density of material of the rod may be taken as 8000 kg/m³ and the allowable stress in the bolts as 60 N/mm² and in cap as 80 N/mm². The rod is to be of I-section for which you can choose your own proportions. **10**
Draw a neat dimensioned sketch showing provision for lubrication. Use Rankine formula for which the numerator constant may be taken as 320 N/mm² and the denominator constant 1 / 7500
(b) State the function of the following for an internal combustion engine piston: **04**
Piston rings , Piston skirt, Piston pin, valves.
