GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VI- EXAMINATION - SUMMER 2016 Date:19/05/2016

Subject Code:160201

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 (stribeck'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 $(0.154 - 0.912/T_F)$ where T_F 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
03	(a)	Discuss the procedure for designing multispeed gearbox	07
Q	(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 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 = $42 x$ 103 Kj/kg; Speed = 2000r.p.m. Taking Permissible bending or tensile stress for C.I = 38N/mm2; 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 $W/m/^{\circ}C$, and Temperature difference at the centre of the piston head and temperature at the edges piston head is = $220^{\circ}C$; Pressure of the gas on cylinder wall is 0.035; Allawable 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/mm2 Bending stress for piston pin is 140N/mm2	08

OR

A ball bearing subjected to radial load of 5KN is expected to have a life of 8000hr at 07 **Q.4 (a)** 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%

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- (b) Four stroke diesel engine has following specifications: Brake Power = 5kw; Speed = 07 1200r.p.m; Indicated mean effective pressure = 0.38N/mm2 ; Mechanical efficiency = 80%. Length of stroke 1 = 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.
- 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

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.

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: Piston rings, Piston skirt, Piston pin, valves.

07

04