Seat No.: _____ *Enrolment No._____*

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- VIth SEMESTER–EXAMINATION – MAY- 2012

Subject code: 160201 **Date: 09/05/2012**

Subject Name: Automobile Component Design

Time: 10:30 am – 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)**	Classify the different types of bearings.	**07**
	(b)	Explain advantages and limitations of gear drive compared to other transmission devices.	**07**
Q.2	**(a)**	Explain materials selection for gears.	**07**
	(b)	Give a sketch of piston and write down design equations for working out various geometrical parameters of the same.	**07**
		OR	
	(b)	Explain creep and wear considerations in design.	**07**
Q.3	**(a)**	Explain Design Criteria of intake manifold and exhaust manifold.	**07**
	(b)	Explain with neat sketch, the design procedure of an I.C. Engine's centre crankshaft for maximum bending moment condition.	**07**
		OR	
Q.3	**(a)**	Explain design considerations for gear box.	**07**
	(b)	What is factor of safety? Describe various factors influencing the value of factor of safety.	**07**
Q.4	**(a)**	Explain lubrication and mounting/dismounting of bearings.	**07**
	(b)	A radial ball bearing has a basic load rating 50 kN. If the desired rating life of the bearing is 6000 hours, what equivalent radial load can the bearing carry at 500 rev/min.	**07**
		OR	
Q.4	**(a)**	Explain selection of Engine layouts.	**07**
	(b)	Sketch a valve gear mechanism, name different parts in it and list materials of valve and rocker arm.	**07**
Q.5	**(a)**	Define following terms in relation to bearings: Sommerfields's No. and Bearing Modulus.	**04**
	(b)	A connecting rod is to be designed with two ends for a 4-stroke petrol engine having the following specifications: Piston diameter=150mm Stroke length=150mm Length of connecting rod=320mm Mass of reciprocating parts/cyl=2 Kg Speed of the engine= 1500 rpm Compression ratio= 4:1 Maximum explosion pressure=2.5 MPa Yield stress of the rod material = 320 MPa Factor of safety= 5. Select 5t x 4t – I section and justify your selection.	**10**
		OR	

Q.5 **(a)** Define following terms in relation to gear: Backlash, module, pitch, clearance. **04**

(b) Design a helical gear pair using following specifications: **10**

Particulars	Materials	Static Stress N/mm^2	B.H.N.	E-Modulus of Elasticity
Pinion	Steel	140	250	$2.1x10^5$
Gear	Steel	140	350	$2.1x10^5$

Power transmitted=30 kW
Speed of pinion= 1500 rpm
Velocity ratio= 4
Tooth profile = 20^o Full depth involute
Helix angle= 30^o
Maximum Nos. of teeth on pinion= 24
Wear and lubrication factor= 1.15
Dynamic factor C= 583 N/mm.
Check your design for dynamic and wear load.

Take, $Ft = 0.75\ f_b\ f\ m_a\ y_f\ c_v$

$$F_d = Ft + \frac{21V(c\ f\ \cos^2\beta + Ft)\cos\beta}{21V + \sqrt{c\ f\ \cos^2\beta + Ft}}$$

$$Fw = \frac{Dp\ f\ Kw\ Q}{\cos^2\beta}$$

$$Z_f = \frac{Zp}{\cos^3\beta}$$

$$Y_f = \pi\frac{(\ 0.154\ Z_f - 0.912\ )}{Z_f}$$

Where, m_a = modulus in the normal plane
Y_f = Lewis form factor corresponding to Z_f teeth

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