

GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER-VI • EXAMINATION – WINTER 2013

Subject Code: 160201**Date: 27-11-2013****Subject Name: Automobile Component Design****Time: 02:30 pm to 05:00 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) Differentiate between casting versus welding consideration in design of automobile component. **07**
- (b) Differentiate between dry and wet liner. Describe the ideal properties required for engine cylinder material. **07**
- Q.2** (a) Describe the procedure to find out the size of opening of suction and exhaust valve for given I.C. engine. **04**
- (b) Following data refers to 4-stroke 4-cylinder petrol engine: **10**
 Cylinder bore =100 mm ,Stroke length =125 mm , Maximum explosion pressure=2.5 MPa , Power developed = 80 KW ,Specific fuel consumption = 180 gm/kwh , speed=2500 r.p.m. , Permissible tensile stress for material of piston = 40 MPa , Permissible bending stress for piston pin =120 MPa .Determine 1) Piston crown thickness based on strength and heat dissipation point of view 2) piston pin size

OR

- (b) Design a connecting rod for a high speed diesel engine from the following data: **10**
 Cylinder bore = 100 mm,Stroke = 120 mm,Maximum speed = 1800 rpm,Compression ratio = 18,Max. Explosion pressure = 5 MPa,Mass of reciprocating parts = 3.5 Kg, Length of connecting rod = 240 mm, If the connecting rod is made of drop forged steel, determine the size of I-section, size of small end bearing, big end bearing and bolts. Assume suitable stresses.
- Q.3** (a) A pair of parallel helical gears consists of a 20 teeth pinion meshing with a 100 teeth gear. The pinion rotates at 720 rpm. The normal pressure angle is 20° , while the helix angle 25° . The face width is 40 mm and the normal module is 40 mm. The pinion as well as the gear are made of steel 40C8 having ultimate tensile strength of 600 N/mm^2 and heat treated to a surface hardness of 300 BHN. The service factor and the factor of safety are 1.5 and 2 respectively. Assume that the velocity factor accounts for the dynamic load and calculate the power transmitting capacity of gears **10**
- (b) Explain the different causes of gear tooth failures and suggest possible remedies to avoid such failures. **04**

OR

- Q.3** (a) Design a spur gear drive to drive a pump impeller from a 5 KW ,600 r.p.m. motor with as small centre distance as possible, with a reduction ratio of 4.5 : 1. Use following materials for the gears: **10**

Gear	Material	Static stress	BHN
Pinion	Forged steel	160 MPa	200
gear	Cast steel	100 MPa	180

Use 20° full depth involute profile and check the design for interference. Take $K_s=1.25$, velocity factor $K_v=4.5/4.5+V$ and Lewis factor , $y=0.154- 0.912/Z$ for 20° full depth teeth.

(b) Differentiate between involute and cycloidal profile of the gears. **04**

Q.4 (a) SKF 6306 ball bearing with inner ring rotation has 10 seconds work cycle as follows: **10**

	For 2 sec.	For 8 sec.
Radial load	3640 N	2730 N
Axial load	1820 N	0
RPM	900	1200
Type of load	Light shock	Steady load

For SKF bearing static capacity, $C_0 = 14600$ N and dynamic capacity, $C = 22000$ N. Find the expected average life of the bearing.

(b) Explain the following terms in relation with rolling contact bearings: **04**
1) Static load capacity, 2) Dynamic load capacity

OR

Q.4 (a) A single row deep groove ball bearing is subjected to a radial force of 8 kN and a thrust force of 3 kN. The values of X and Y factors are 0.56 and 1.5 respectively. The shaft rotates at 1200 rpm. The diameter of the shaft is 75 mm and bearing No. 6312 ($C = 112000$ N) is selected for this application. Estimate the life of this bearing, with 90% reliability and Estimate the reliability for 20000 hrs life. **10**

(b) Explain the following terms in relation with rolling contact bearing **04**
1) Equivalent load, 2) Bearing life.

Q.5 (a) Explain the step by step procedure to design the flywheel of an given I.C. engine. **07**

(b) A cast iron bevel gear has a module of 2.5 mm and its pitch diameter is 0.60 m. The pitch angle is 30° and the teeth are 20° full depth. Determine the permissible endurance load. Take flexural endurance limit of C.I. as 84 MPa. **07**

OR

Q.5 (a) Design a suitable speed gear box for a head stock of a lathe that has a variation of speed from 105 r.p.m. to 690 r.p.m. in 9 steps. The power is supplied by an electric motor of 10 KW capacity running at 1000 r.p.m. and having driving the input shaft through a V-belt drive having speed ratio of 2 : 1. Draw the structural diagram, speed chart and determine the number of teeth on each gears. **07**

(b) Give advantages and drawback of worm gear **07**
