Seat No.: \_\_\_\_\_

Enrolment No.

# GUJARAT TECHNOLOGICAL UNIVERSITY PDDC - SEMESTER-VIII EXAMINATION - SUMMER 2016

Subject Code:X81902
Subject Name: Machine Design-II
Time:10:30 AM TO 01:00 PM
Instructions

Date:12/05/2016

**Total Marks: 70** 

04

**Instructions:** 

- 1. Attempt all questions.
- 2. Make suitable assumptions wherever necessary.
- 3. Figures to the right indicate full marks.
- 4. Draw neat sketches wherever necessary to justify answers. 5.Use of STANDARD DESIGN DATA BOOK is permissible.
- 0.1 Draw speed ray diagram and layout for a six speed gear box. The out put 07 (a) Speed are 160 r.p.m. minimum and 1000 r.p.m. maximum. The motor speed is 1440 r.p.m.
  - It is required to design a pair of bevel gears, which are mounted on 07 **(b)** shafts intersecting at right angles. The pinion receives 20 kW power through its shaft and rotates at 720 rpm. The number of teeth on pinion and gear are 30 & 45 respectively. The pressure angle is  $20^{\circ}$  full depth teeth form. The gears are made of plain carbon steel with permissible bending stress as 200 MPa. The gears are case hardened and the surface hardness is 300 BHN. Take service factor = 1.25.
- **Q.2** Answer the following (any one): (a)
  - 1. Explain different modes of gear teeth failures, stating their reasons and remedies.
  - 2. Explain gear materials in detail.
  - (b) Design a spur gear pair from the following given data: 10 Power to be transmitted = 6 kWPinion speed = 800 rpm Service factor = 1.5Speed reduction = 5Factor of safety = 2Pitch line velocity = 3.6 m/sec (For initial calculation of module) Maximum permissible error in gear tooth profile = 0.108 mmVelocity factor = 3/(3 + V), where V is the pitch line velocity in m/s. Take face width to module ratio = 10Lewis form factor = 0.154 - 0.912/No. of teeth - for  $20^{\circ}$  pressure angle involute tooth system. The materials and stresses for pinion and gear are as under:  $[\sigma_b] = 150 \text{ N/mm}^2$   $E = 2.1 \text{ x } 10^5 \text{ N/mm}^2$ Steel Hardness = 260 BHN

### OR

Design a pair of helical gears to transmit 5 kW power at a speed of 2000 rpm of **(b)** 10 pinion. The helix angle is approximately  $15^{\circ}$  and  $20^{\circ}$  full depth teeth are used. Both the gear and pinion are made of hardened steel with permissible bending stress 220 N/mm<sup>2</sup>. Take number of teeth on pinion and gear are equal to 26 and

100 respectively. Take service factor = 1.5 and factor of safety = 1.8. For initial calculation of module, assume pitch line velocity = 10 m/sec.Maximum permissible error in gear tooth profile = 0.046 mm and face width to normal module ratio = 12. Also check your design for dynamic load and determine minimum hardness of teeth required.

10

## Q.3 (a) Why 'I' section is chosen for the connecting rod in the design of I.C.Engine? 04

- (b) The cylinder of a four stroke diesel engine has the following specifications: Brake power = 7.5 kW; Speed = 1400 rpm; Maximum gas pressure = 3.5 MPa; Indicated mean effective pressure = 0.35 MPa; Mechanical efficiency = 82 %; The cylinder liner and head are made of grey cast iron (Sut = 250 MPa and  $\mu = 0.25$ ). The factor of safety for all parts is 6. Calculate:
  - 1. Bore and length of the cylinder liner
  - 2. Thickness of the cylinder liner (Take, C = 3.2 mm)
  - 3. Thickness of the cylinder head.

### OR

Q.3	(a) (b)	Write a short note on piston materials. Design a connecting rod for a petrol engin Diameter of piston = 106 mm Length of connecting rod = 340 mm Speed = 1600 rpm with 50 % overdrive	ne from the following data: Mass of reciprocating parts = 22 N Stroke = 140 mm Compression ratio = 7:1	04 10
		Maximum explosion pressure = 2.5 MPa Yield strength of connecting rod material Factor of safety = 5 Standard' I' – cross section = 4t x 3t x Permissible bearing pressure for big end =	= 320 MPa Rankine's constant = 1/7500 t = 8 MPa	0
		Permissible bearing pressure for small end = 14 MPa Select the suitable material for other parts and permissible stresses for them.		
Q.4	(a)	(a) Explain the design of valves gears mechanism with a neat sketch.		

(b) Explain the importance of thermal consideration in worm and worm gear 07 design.

#### OR

#### State and explain the reasons for dynamic load in gear design. 07 **Q.4** (a) Explain the design of flywheel with a neat sketch. **(b)** 07 Q.5 State the benefits of conveyors over the other material handling equipments. 07 **(a)** Differentiate between screw conveyor and vibratory conveyor. Explain the designation of wire ropes as per BIS. State the advantages and 07 **(b)** selection/design of the wire ropes. OR

- Q.5 (a) Classify the material handling equipment. Explain the different factors affecting 07 selection of material handling equipment.
  - (b) Design the crane hook for a load lifting capacity of 60 kN with 50 % overload capacity. The material for hook is forged steel for which allowable tensile stress may be taken as 180 N/mm<sup>2</sup>. Choose triangular cross section for the hook.