Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

PDDC - SEMESTER– VIII • EXAMINATION – WINTER 2016

Subject Code: X81902 **Date:26/10/2016**

Subject Name: Machine Design - II

Time:02.30 pm - 05.00 PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Illustrate your answer with neat sketches wherever required.**
4. **Figures to the right indicate full marks.**
5. **Use of PSG Design Data Book is permitted in exam.**

Q.1 **(a)** What are the various laws for stepped regulation of speeds in multi-speed gear boxes ? State the advantages of geometric progression **04**

(b) A multi-speed gear box is to be designed for a small-size, general purpose machine tool for spindle speeds varying between 56 r.p.m. and 1000 r.p.m. If the recommended geometric progression ratio is as per R4 series : **10**

Draw the optimum structure diagram and speed diagram for the arrangement.

If the gear box is to be driven by 720 r.p.m., three – phase A.C. motor through a belt drive, determine the ratio of belt pulley diameters. Also draw the gear box layout.

Q.2 **(a)** List and explain the basic objectives of material handling system. **07**

(b) Give the classification of material handling equipment. Explain any one equipment. **07**

OR

(b) State and explain the various factors considered while selecting the material handling equipment for a given application. **07**

Q.3 Design a cylinder, cylinder head and cylinder head studs for a four – stroke C.I. engine with the following data : **14**

Brake power	=	5 kW
Engine speed	=	1200 r.p.m.
Indicated mean effective pressure	=	0.35 N / mm^2
Maximum gas pressure	=	3.5 N / mm^2
Mechanical efficiency	=	80 %
Compression ratio	=	12
Reboring factor, C_1	=	4 mm
Cylinder head thickness constant, k_1	=	0.35

Allowable tensile stresses :

Name of Part	**Cylinder Liner**	**Cylinder Head**	**Studs**
Material	Alloy cast iron	Alloy cast iron	Alloy steel, 40 Ni 3
Allowable Tensile Stress N / mm^2	40	40	70

OR

Q.3 Design a piston for a single cylinder four stroke diesel engine with the following specifications : **14**

Cylinder bore	=	0.30 m
Stroke length	=	0.375 m
Maximum gas pressure	=	8 MPa
Brake mean effective pressure	=	1.15 MPa
Brake specific fuel consumption	=	0.22 kg / kW-h
Speed	=	500 r.p.m.

Assume additional suitable data.

Q.4 **(a)** State the advantages and disadvantages of helical gears. **04**

(b) A pair of helical gears consists of 18 teeth pinion meshing with 45 teeth gear. The normal module is 5 mm, while the normal pressure angle is 20°. If the helix angle is 23°, calculate : **10**

1) The transverse module;
2) The transverse pressure angle;
3) The axial pitch;
4) The pitch circle diameters of the pinion and the gear;
5) The centre distance;
6) The addendum and dedendum circle diameters of the pinion; and
7) The gear ratio.

OR

Q.4 **(a)** List and briefly explain the system of gear teeth. **04**

(b) A pair of cast iron bevel gears connect two shafts at right angles. The pitch diameters of the pinion and gear are 80 mm and 100 mm respectively. The tooth profiles of the gears are of 14 1/2º composite form. The allowable static stress for both the gears is 55 MPa. If the pinion transmits 2.75 kW at 1100 r.p.m., find the module and number of teeth on each gear from the standpoint of strength and check the design from the standpoint of wear. Take surface endurance limit as 630 MPa and modulus of elasticity for cast iron as 84 kN / mm^2. **10**

Q.5 Design a spur gear drive to transmit 20 KW 1440 rpm. Speed reduction is 3 Materials for pinion and wheel are C45 Steel and Cast Steel Grade 35 Ni1Cr60respectively. Take pressure angle 20° and working life of the gears as 10,000 hours. **14**

OR

Q.5 Design 20° involute worm and gear to transmit 10 kW with worm rotating at 1400 r.p.m. and to obtain a speed reduction of 12 : 1. The distance between the shafts is 225 mm. **14**

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