GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VIII (OLD) EXAMINATION – WINTER 2018

Subject Code: 181902   **Date: 15/11/2018**

Subject Name: Machine Design -II

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)**	What is pitting and scoring? Explain the different causes of gear tooth failure and suggest possible remedies to avoid such failures.	**07**
	(b)	Design a spur gear pair from the following given data.	**07**

Power to be transmitted = 22.5 kW,

Pinion speed = 1450 rpm,

Speed reduction = 2.5,

No. of teeth on pinion = 20,

Service factor = 1.5, b= 10m,

Pitch line velocity = 5 m/sec (For initial calculation of module),

Maximum permissible error in gear tooth profile = 0.025 mm,

k = A factor depending upon the form of teeth = 0.111,

Velocity factor = 3/ (3 + V), where V is the pitch line velocity in m/s.

Take endurance surface hardness = 600 MPa

Lewis form factor = $0.154 – 0.912/$ No. of teeth for 20^0 pressure angle involute tooth system. The materials and stresses are as under:

Material	[σb]	Elasticity Modulus	Hardness
Pinion (Fe 410)	135 N/ mm^2	2.1 x 105 N/mm^2	260 BHN
Gear (FG 200)	65 N/ mm^2	1.1 x 105N/ mm^2	250 BHN

Q.2	**(a)(i)**	What are the advantages of helical gears over spur gears?	**04**
	(a)(ii)	Discuss the lubrication of gears	**03**
	(b)	A pair of helical gears having a transmission ratio 8:3, with a steady load condition, used for turbine. The maximum speed is 2400 r.p.m. The pinion is to have 27 teeth and a face width of 100 mm. The circular module is 6 mm. The material used for gears is heat treated steel with 250 BHN and have static stress of 210 MPa. The gears are carefully cut. Calculate value of dynamic load and wear load.	**07**

OR

	(b)	Write basic objectives of material handling system.	**07**

Q.3	**(a)**	Describe the criteria for deciding the size of suction and exhaust valve of an I.C. engine.	**07**
	(b)	Explain the procedure of designing multi speed gear box.	**07**

OR

Q.3	**(a)**	What are the design requirements of Piston in engine? Explain.	**07**
	(b)	Two shafts at right to each other are connected by a bevel pair having full depth involute teeth. The pinion having 20 teeth transmits 40 kW at 750 rpm to gear shaft running at 375 rpm. Take allowable static stress for pinion and gear	**07**

materials 100 and 70 N/mm^2 respectively. Determine module, pitch diameters and face width from strength considerations.

Q.4	**(a)**	Explain thermal consideration while designing worm and worm wheel drive.	**04**
	(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.

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OR

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Q.4	**(a)**	Classify the conveyors. Explain construction and working of any one conveyor.	**07**
	(b)	Why trapezoidal section is used for hook? Draw a neat sketch of single hook and show the critical section on it.	**07**

Q.5	**(a)**	What do you understand by 6 x 37 ropes? Explain with neat sketch the different rope section.	**07**
	(b)	State the main parts commonly used in materials handling equipments along with neat sketch. Explain the design of drum and selection of suitable wire rope in detail.	**07**

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OR

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Q.5	**(a)**	Design a plain carbon steel center crankshaft for a single acting four stroke, single cylinder engine for the following data:	**14**

Piston diameter = 250 mm;
Stroke = 400 mm;
Maximum combustion pressure = 2.5 MPa;
Weight of the flywheel = 5 kg;
Total belt pull = 100 N;
Length of connecting rod = 950 mm.
The flywheel is used as a pulley. When the crank has turned through 300 from top dead centre, the pressure on the piston is 1 MPa and the torque on the crank is maximum. Any other data required for the design may be assumed.

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