

Seat No.: _____

Enrolment No. _____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER-VII (NEW) - EXAMINATION – SUMMER 2018

Subject Code:2171909

Date:08/05/2018

Subject Name:Machine Design

Time:02.30 PM to 05.30 PM

Total Marks: 70

Instructions:

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Use of data book is permitted

		MARKS
Q.1	(a) Give classification of gears.	03
	(b) Give selection criteria of bearings in a particular application.	04
	(c) Prove that “The common normal to the tooth profile at the point of contact should always pass through a fixed point, in order to obtain constant velocity ratio”.	07
Q.2	(a) What is the minimum number of teeth on spur gear? Why?	03
	(b) Explain interference and undercutting in involute gear tooth profile.	04
	(c) A pair of spur gears consists of a 20 teeth pinion meshing with a 120 teeth gear. The module is 4 mm. calculate (i) the center distance, (ii) the pitch circle diameter of the pinion and gear, (iii) the addendum and dedendum, (iv) the tooth thickness, (v) the bottom clearance, and (vi) the gear ratio.	07
	OR	
	(c) A pair of bevel gears transmitting 7.5 kW at 300 rpm is shown in fig.1 . the pressure angle is 20° . Determine of the components the resultant gear tooth force and draw a free body diagram of forces acting on the pinion and gear.	07
Q.3	(a) Why are worm gear reduction units not preferred over other types of gearboxes for transmitting large powers?	03
	(b) What is herringbone gear? State two advantages of herringbone and double helical gear.	04
	(c) The dimensions of a hydrostatic thrust bearing with a rectangular oil-groove A, are shown in Fig-2 . The pressure distribution can be assumed to be linear, varying from supply pressure at the inner edge of the groove to atmospheric pressure at the outer edge of the pad. The flow over the corners can be neglected. The thrust load is 100 kN and the film thickness is 0.02 mm. the viscosity of the lubrication oil is 300 cP. Calculate: (i) supply pressure, and (ii) requirement of flow.	07
	OR	
Q.3	(a) Define dynamic load carrying capacity of rolling contact bearing. What are the function of bearing?	03
	(b) Explain Load-Life relationship in context with bearing.	04
	(c) A single row deep groove ball bearing No. 6002 is subjected to an axial thrust of 1000 N and a radial load of 2200 N. find the expected life that 50% of the bearings will complete under this condition.	07
Q.4	(a) What is the criterion for design of push rod?	03
	(b) Name the materials used for engine cylinder and engine piston.	04
	(c) The bore of a cylinder of the four-stroke diesel engine is 150 mm. the maximum gas pressure inside the cylinder is limited to 3.5 MPa. The	07

cylinder head is made of grey cast iron FG 200 ($S_{ut} = 200 \text{ N/mm}^2$) and the factor of safety is 5. Determine the thickness of the cylinder head. Stud are used to fix the cylinder head to the cylinder and obtain a leakage proof joint. They are made of steel FeE ($S_{yt} = 250 \text{ N/mm}^2$) and the factor of safety is 5. Calculate (i) number of studs, (ii) nominal diameter of studs, (iii) pitch of studs.

OR

- Q.4** (a) Why is the area of inlet valve port more than that of an exhaust valve? **03**
(b) What are the design requirements of piston? **04**
(c) The following data is given for the piston of a four-stroke diesel engine: cylinder bore = 250 mm, material for piston rings = grey cast iron, allowable tensile strength = 100 N/mm², allowable radial pressure on cylinder wall = 0.03 MPa, thickness of piston head = 42 mm, number of piston rings = 4. Calculate, **07**
1. Radial width of the piston rings.
 2. Axial thickness of the piston rings.
 3. Gap between the free ends of the piston ring before assembly.
 4. Gap between the free ends of the piston ring after assembly.
 5. Width of the top land.
 6. Width of the ring grooves.
 7. Thickness of piston barrel.

- Q.5** (a) Draw rope sheave and drum with usual notations. **03**
(b) Give classification of cranes. **04**
(c) Discuss stresses in wire rope with usual formulae. **07**

OR

- Q.5** (a) When do you use Johnson's equation for buckling columns? **03**
(b) Write advantages of wire rope. Draw cross section of 7, 19 and 37 wires in strand of wire rope. **04**
(c) Give Classification and application of various Material handling equipment. **07**

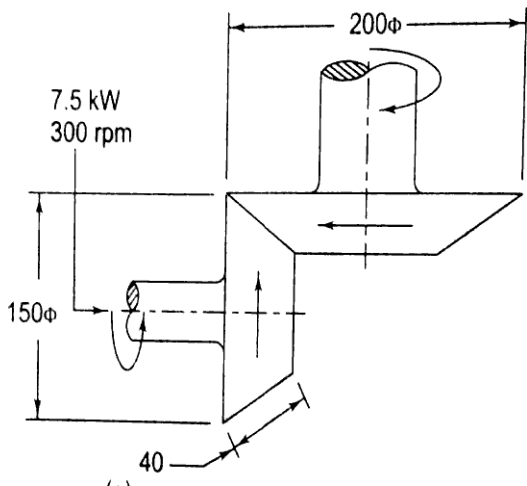


Figure-1

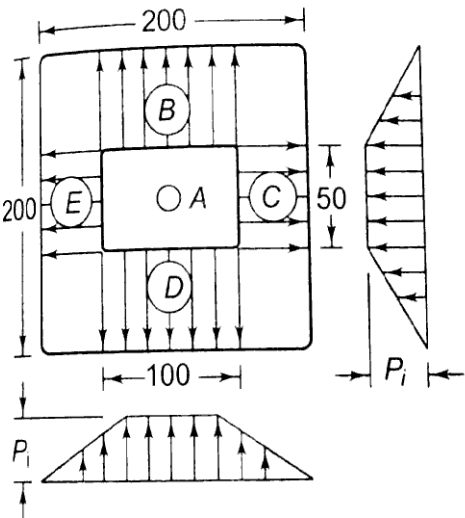


Figure-2
