

Name:

Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, Oct. 2019

Programme Name: B.Tech/ADE

Course Name : Design of machine elements

Course Code : MECH 3001

Nos. of page(s) : 02

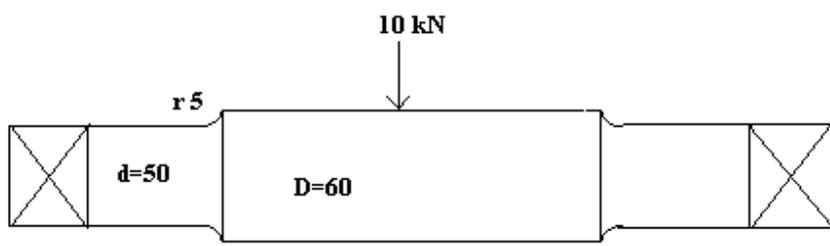
Semester : V

Time : 03 hrs

Max. Marks: 100

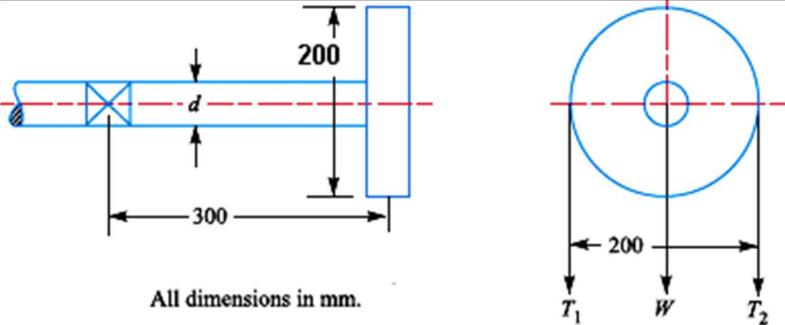
Instructions: Attempt all the questions as directed. Assume suitable data if missing. Use of data handbook is permitted.

SECTION A

S. No.		Marks	CO
Q 1	Discuss the various design consideration for strength. Also, differentiate between the failure criteria for static loading and fatigue loading.	7	CO2
Q 2	Discuss the various types of gear tooth failures.	7	CO4
Q 3	Explain the importance of bearing modulus in designing the journal bearing.	8	CO5
Q 4	<p>A shaft carrying load of 10 kN midway between two bearings as shown in figure. Determine the maximum bending stress induced in shaft. Consider the effect of fillet.</p>  <p><i>D, d and r are in mm.</i></p>	8	CO2

SECTION B

Q 5	Design a shaft to transmit power from an electric motor to a lathe head stock through a pulley by means of a belt drive. The pulley weighs 200 N and is located at 300 mm from the centre of the bearing. The diameter of the pulley is 200 mm and the maximum power transmitted is 1 kW at 120 r.p.m. The angle of wrap of the belt is 180° and coefficient of friction between the belt and the pulley is 0.3. Select a suitable material for shaft and design as per ASME code.	15	CO4
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	 <p style="text-align: center;">All dimensions in mm.</p>		
Q 6	<p>Two mild steel rods are connected by a knuckle joint to transmit an axial load of 150 kN. Design the joint completely. Assume the working stresses for both the pin and rod material as 80 N/mm² in tension, 68 N/mm² in shear and 160 N/mm² in crushing. Assume that the rods to be connected are not very long.</p>	15	CO3
Q 7	<p>A full journal bearing of 0.10 m diameter by 0.15 m long supports a radial load of 5500 N. The shaft speed is 500 rev/min. The room temperature is 32^o C and the surface of the bearing is to be limited to 63^o C. Select suitable oil to satisfy the above requirements, if the bearing is well ventilated and no artificial cooling is to be used. Assume $D/C_d = 1000$.</p> <p style="text-align: center;">OR</p> <p>Select a single row deep groove ball bearing for a radial load of 8000 N and an axial load of 3000 N, operating at a speed of 1440 rpm, for an average life of 4 years at 10 hours per day. Assume uniform and steady load. Take the bore diameter as 100 mm.</p>	15	CO5
SECTION-C			
Q 8	<p>A rawhide pinion is to transmit 30 KW at 1150 rev/min. Select a standard module for 20 degree full depth involute teeth, assuming medium shock condition and the power source as multi-cylinder engine.</p> <p style="text-align: center;">OR</p> <p>A compressor running at 400 rev/min, is driven by a 125 kW, 1440 rev/min motor through a pair of 20 degree full depth helical gears having helix angle 22 degree. The central distance is approximately 300 mm. The motor pinion is made off forged steel and the driven gear is to be of cast steel. Assume medium shock conditions. Design the gear pair.</p>	25	CO4