

TCET

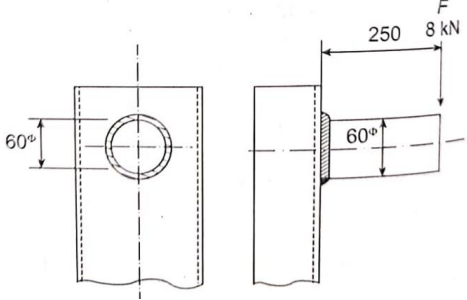
End semester examination, First Half - 2021

Name of Subject: Machine Design 1	Question paper code:
Subject code: PCCME601	PCCME6010311
Time: 10:30 to 12:45 pm	Duration: 135 min
Maximum marks:75	Date: 03-05-2021

Instructions:1) Use of PSG data book is permitted

2) Required data can be assumed accordingly

	Subjective Type Question (40 Marks)	
Q1	Solve any three (12 Marks)	
Q1.a	What is scope of ergonomics ? why is it important in engineering design	4
Q1.b	List the assumptions made in obtaining stress equation in curved beam	4
Q1.c	Give any two examples of stress raisers and how stress concentration can be reduced in these cases	4
Q1.d	Explain surge in springs	4
Q2	Solve any Two (12 Marks)	
Q2.a	A circular pipe is subjected to an axial force of 120kN and a twisting moment of 50N-m. The steel used for the pipe has a yield strength of 300N/mm ² . If the factor of safety should not be less than 3, calculate the outside and inside diameters of the pipe using the following theories of failure a) Maximum principal stress theory b) Maximum distortion theory	6
Q2.b	A spring balance has to be designed for measuring weights .An extension spring is considered for the purpose. The maximum weight that can be measured on the spring balance is 2kN and the corresponding length of the scale should be approximately 150mm. The spring material has an ultimate strength of 1400Mpa approximately .The shear strength of the spring material is 50% of S _u .Taking G=81370Mpa and spring index of 5.Calculate the following a) Wire diameter b) Mean coil diameter c) Number of active coils d) Required spring rate e) Free length	6
Q2.c	A 60-mm diameter steel bar with a length of 250 mm is welded as a cantilever beam on a steel column as shown in Fig. Determine the size of the circular weld required around the steel bar on the column. Safe shear stress in the weld may be taken as 100 N/mm ² .	6

		
Q3	Solve any Two (16 Marks)	
Q3.a	Select a standard hook of trapezoidal c/s to lift a load of 110kN and find the stress induced at the critical c/s	8
Q3.b	A cast iron protected type flange coupling is used to connect two shafts of 80 mm diameter. The shaft runs at 300 rpm and transmits a power of 150kw. The permissible shear stress for the shaft and bolt materials is 50 MPa and permissible shear stress for flange material is 10Mpa.Design the coupling	8
Q3.c	Design a knuckle joint for a tie rod of circular c/s to sustain a maximum tensile load of 75 kN. The material used for the joint has following permissible stresses: 120 MPa in tension 80 MPa in shear and 180Mpa in crushing	8