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[5559]-217

S.E. (Chemical) (Second Semester) EXAMINATION, 2019

PRINCIPLES OF DESIGN

(2015 PATTERN)

Time : 2 Hours

Maximum Marks : 50

- Instructions: 1) Neat diagrams must be drawn **wherever** necessary.
2) Figures to the right indicate full marks.
3) Assume suitable data, **if** necessary.
4) Use of calculator is allowed.

Q1	a	What are the various theory of failure.	6M
	b	A simply supported beam 6m long is carrying a uniformly distributed load of 2KN/m over a length of 3m from the right end. Draw the S.F and B.M diagram for the beam and also calculate the maximum B.M on the section.	6M
		OR	
Q2	a	A steel rod of 60mm diameter, 560mm long is subjected to axial forces alternating between maximum compression of 30KN and a maximum tension of 10KN. Find the difference between the greatest and least lengths of the rod. $E=210\text{GPa}$.	6M
	b	Define stress, streain and elasticity. Derive a relation between stress and strain of elastic body.	6M
Q3	a	Write steps to design Split muff coupling.	6M
	b	A flat belt is required to transmit 30KW for a Pulley of 1.5 m effective diameter running at 300 r p m .The angle of contact is spread over $11/24$ of the circumference. The coefficient of friction between the belt and pulley surface is 0.3. Determine taking centrifugal tension into account, width of the belt required .It is given that the bolt thickness is 9.5mm ,density of its material is 1100Kg/m^3 and the related permissible working stress is 2.5MPa.	7M
		OR	
4	a	Discuss the function of coupling .Give at least three practical application.	6M

P.T.O.

	b	A shaft rotating at constant speed is subjected to variable load. The bearing supporting the shaft are subjected to stationary equivalent radial load of 3KN for 10 percent of time 0.2KN for 20 percent of time ,1KNfor 30 percent of time and no load for remaining time of cycle .If the total life expected for the bearing is 20×10^6 revolutions at 95 percent reliability .calculate dynamic load rating of the ball bearing.	7M
Q5	a	A thick walled high pressure vessel has 500mm inside diameter .It is subjective to an internal pressure of 6000 bar the yield strength of material is 5000 Kg/cm^2 .Ultimate tensile strength of material is 6500 Kg/cm^2 .Calculate the thickness of vessel according to the various theories of failure.Factor of safety is 1.4.Also estimate the tangential stress and radial stress variation along the vessel wall.	6M
	b	Write neat sketches explain types of flanged joints used in pressure vessel.	6M

		OR	
6	a	Explain the various types of ends used for pressure vessel giving practical applications of each.	6M
	b	A Pressure vessel is required to process 19 m^3 non-hazardous slurry at 17.7 kg/cm^2 , maximum operating temperature are 5°C and 175°C . The cylindrical shell of the vessel is closed at both end by 2.1 elliptical head with 5 cm straight flange portion, the maximum ratio of liquid height to vessel diameter is 1.9. The vessel is fabricated from SS 316 having permissible stress 1140 kg/cm^2 . The welded joint efficiency is 85%. No corrosion allowance is necessary. Maximum diameter of the vessel can be 2.4 m. Calculate (i) the height of the vessel (ii) Minimum thickness of shell and elliptical head.	6M
7	a	Calculate the thickness of a flanged torispherical head for a vessel having internal diameter 6000 mm. Design pressure of the vessel is 3.4 kg/cm^2 . Inside crown radius is 6000 mm. Inside knuckle radius is 380 mm. Permissible stress of the material is 1190 kg/cm^2 , welded joint efficiency is 100%.	7M
	b	Write short note on Autofretting of monoblock Pressure vessels.	6M
		OR	
8	a	Write distinguishing points between a thick and thin cylinder.	6M
	b	Calculate the thickness of a torispherical heads (100-6) and (80-6) elliptical head (2:1) and hemispherical head for a pressure vessel having design pressure 7 Kg/cm^2 .diameter of vessel is 1.5 m and permissible stresses 1250 Kg/cm^2 .Welded joint efficiency is 85%.	7M