Sanjay Ghodawat University, Kolhapur

2020-21

Established as State Private University under Govt. of Maharashtra. Act No XL, 2017

EXM/P/09/00

Year and Program: 2020-21 & UG	**School of Technology**	**Department:** Mechanical Engineering
Course Code: MET 4091	**Course Title:**Design of Mechanical Systems	**Semester :**VII
Day :Tuesday **Date:29/12/2020**	**End Semester Examination**	**Time:2 Hrs.** **(11.00 am to 1.00 pm)** **Max Marks:50**

Instructions: 1) All Questions are compulsory.
2)Assume relevant data and state them clearly.

		Marks	Bloom's Level	CO
Q.1	**Answer the following (any Two)**–			
a)	With the help ofneat sketch explain the ergonomic design considerationinvolved in the design ofexecutive chair.	8	L2	CO1
b)	What are the objectives of pre-stressing the high pressure cylinders? Describe the various methods of pre-stressing such cylinder.	8	L2	CO2
c)	An air receiver consisting of a cylinder closed by hemispherical ends is shown in fig. 1. It has a storage capacity of 0.25 m^3 and an operating internal pressure of 5 MPa. It is made of plain carbon steel 10C4 (S_{ut}=340 N/mm^2) and the factor of safety is 4. Neglecting the effect of welded joints, determine the dimensions of receiver.	8	L3	CO2

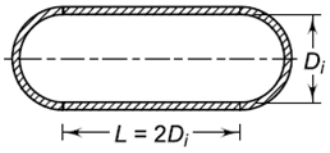


Fig. 1

Q.2	**Answer the following (any two) –**			
a)	A plate clutch consists of one pair of contacting surfaces. The inner and outer diameters of the friction discs are 100 mm and 200 mm respectively. The coefficient of friction is 0.2 and permissible intensity of pressure is 1 N/mm^2. Assuming uniform wear theory calculate power transmitting capacity of at 750 r.p.m.	8	L3	CO3
b)	What is the energy consideration in the design of brakes?	8	L2	CO3
c)	A multispeed gear box is to be designed for a headstock of a turret lathe for nine spindle speeds ranging from 300 rpm to 1000 rpm. If the gear box is driven by 5KW,720 rpm electric motor. 1. Drawstructure, speed, raydiagram 2. Draw gearing diagram	8	L3	CO4

Q.3 Answer the following (any two) –

a) Explain the following terms in Johnson method of optimization. 9 L3 CO5
   1. Primary Design Equation (PDE)
   2. Subsidiary Design Equation (SDE)
   3. Limit Equation (LE)

b) The cylinder ofa four stroke diesel engine as the following specifications 9 L3 CO5
Brake power = 3.75 kW
Speed = 1000 rpm.
Indicated Mean Effect Pressure: 0.35 MPa.
Mechanical Efficiency = 80%
Determine the bore and length of the cylinder linear

c) A shaft is required in a lightweight equipment to transmit a torque of 900Nm and is to have a rigidity of 90 N-m/degree. The F.O.S based on yield strength in shear is 1.5. Using the maximum shear stress theory, design the shaft with the main objective of "MINIMUM WEIGHT" using the following materials 9 L3 CO5

Material	Mass density Kg/m^3	Material cost per unit weight C Rs/N Weight	Tensile Yield strength S_{yt} in MPa	Modulus of Rigidity G, GPa.
Alloy steel	8500	16	130	80
Aluminum alloy	3000	32	50	26.7
Titanium alloy	4800	480	90	40
Magnesium alloy	2100	32	20	16

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