TE Mechanical - Sem-VI DEC. 2025

Paper / Subject Code: 89421 / Machine Design

TE Sem. VI / Mech / Dec. 2025 Date 16/12/2025

[03 Hours] Q.P. Code. 97407 [Total marks – 80] 1/2

N.B.: 1. Question No **1** is **compulsory**
2. Solve **Any Three** questions from the remaining **Five** questions.
3. Assume any **suitable data** if necessary with justification.
4. Use of **Standard Data Book** is permitted
5. Figures to the right indicate full marks.

Q1.		Attempt any **Four** of the following.	**20**
	(a)	State the characteristics of chain drive and discuss the polygon effect.	**05**
	(b)	List out the design considerations in casting & Forging	**05**
	(c)	Explain the nipping of the leaf spring with neat sketch	**05**
	(d)	Explain self-locking and Overhauling Screws?	**05**
	(e)	Define stress concentration and with neat sketches explain various methods to reduce the effect of stress concentration.	**05**
Q2.	**(a)**	Design a Socket and Spigot Cotter Joint for an axial load of 20 KN by selecting suitable material. Check Cotter for bending and draw the neat sketch of joint.	**15**
	(b)	Why and what value of taper is provided on Cotter?	**05**
Q3.	**(a)**	The shaft is supported in bearings 800 mm apart and transmits 10 KW at 960 R.P.M. through a pulley 'C' of 300 mm diameter which is mounted at 350 mm to the right of left hand bearing. The angle of lap is 180^0 and coefficient of friction between the belt & the pulley is 0.3. Select suitable material and design the shaft. Take belt tensions at pulley 'C' as vertically downward. The pulley 'C' weighs 400 N. Sketch the arrangement.	**15**
	(b)	The piston rod of a hydraulic cylinder exerts an operating force of 10 KN. The friction due to piston packing and stuffing box is equivalent to 10% of operating forces. The pressure in cylinder is 10 MPa. The cylinder is made of C.I. with σt =50 MPa. Determine thickness of cylinder using Lame's equation.	**05**
Q4.	**(a)**	DGBB is subjected to a radial load of 6 KN and axial load of 2 KN when operating on 500 rpm. Consider the expected life of 20000 hours with survival probability of 92%. Select suitable standard bearing from the manufacturer's catalogue.	**10**
	(b)	A radial load on 360^0 hydro dynamically lubricated self-contained bearing supports 10kN. The journal rotates at 1440 rpm. Assuming journal length to it diameter as 1 with the bearing length as 50 mm. Take radial clearance as 20 microns, eccentricity as 20 microns, specific gravity of lubricants as 0.86, specific heat of lubricants 2.09 kJ/kg ^{0}C. Find, i. Oil film thickness. ii. Coefficient of friction. iii. Viscosity	**10**

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Q5. (a) A protected type flange coupling is required to transmit 12 KW at 960 r.p.m. Design the coupling by selecting suitable materials for various component. 10

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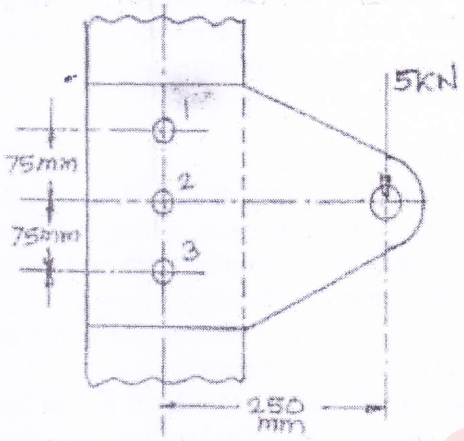
(b) A steel plate is subjected to a force of 5 KN and fixed to a channel by means of 3 identical bolts as shown in fig. no.1. Determine the size of weld if the permissible shear stress for the weld is not to exceed 50 MPa. 10



(Fig. No.1)

Q6. (a) 75 kW power is transmitted by multi-plate clutch at 3000 rpm. The plates run in oil and coefficient of friction is 0.07. Axial intensity of pressure is not to exceed 0.15 N/mm^2. Due to space limitation external radius is restricted to 125 mm. Assuming number of springs as 6. 10

i. Design input and output shaft. ii. Design friction and pressure plates.

(b) A flat belt drive is used to transmit 6 kW power from an electric motor rotating at 1440 rpm to the blower operating at 400 rpm for 10 hours/ day and the expected life of belt is two and half years approximately. Centre to centre distance is 950 mm. Find 10

a. Driving and Driven pulley diameter.

b. Considering Rubber Canvas Material for the belt, determine the thickness and width of the belt.

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