

Allowed Table (None)

This Exam measures ILOS no(a₁,a₂₋₁ a₅₋₂,b₄₋₁,b₅₋₂, ,c₄₋₁,c₈₋₁)

Answer all the following Questions

Note, assume any missing data you need in its convenient range.

Question (1)

(50 marks)

A hydraulic gear pump of 250 kg/cm² oil pressure and 150 lit/ min .discharge is driven by 200HP,and 3000rpm diesel engine of a lorry .The pump feeds a hydraulic circuit used in turning of the lorry box with a charge of 8 ton, 60 degree from the horizontal plane as shown in Figure. The weight of empty box is equal to 300 kg. Taking modulus of elasticity=2.06 x10⁶ kg/cm for steel C60.

- 1-Make complete design (calculation and construction for piston ,cylinder rod and cover) . (40 marks)
- 2-Costruct disc seat valve with its symbols- Gear pump, Draw symbol of tandem cylinder. (10marks)

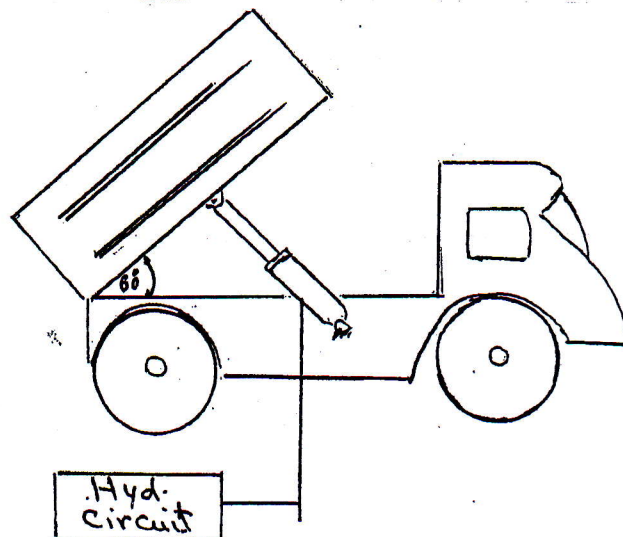
(20 marks)

Question(2)

An automotive type clutch utilize friction in transmitting a torque from one member to another. The normal force on the friction surface is supplied by helical compression springs, so that the clutch is always engaged unless an internal force is applied to compress further the spring and release clutch. A total of 8 springs will be used to supply the normal force, if the initial deflection of spring is 6 mm and the necessary gap to release clutch is 2mm. Using the following data :D=40cm, d_{sh} =15cm ,f=0.25 The engine power= 130HP The speed=1000rpm

Determine:

- a-The necessary axial force at the friction surface. (5marks)
- b-Design the proper actuating mechanism .(10marks)
- c-Calculate the stiffness of the spring which affect the engagement.(5marks)



Answer the following questions:-

Question No.3 (Split Bearing)

(10 marks)

A) Explain with sketches the different types of thrust bearing. (3 marks)

B) A wall bracket supports a plummer block for 80 mm diameter shaft. The length of bearing is 120 mm. The cap of bearing is fastened by means of four bolts, two on each side of the shaft. The cap is to withstand a load of 16.5 kN. The distance between the center lines of the bolts is 150 mm. Determine the thickness of the bearing cap and the diameter of the bolts. Assume safe stresses in tension for the material of the cap, which is cast iron, as 15 MPa and for bolts as 35 MPa. Also check the deflection of the bearing cap taking $E=110\text{kN/mm}^2$. (Draw a neat sketch of the cap bearing). (7 marks)

Question No.4 (Ball and Rolling contact Bearing)

(30 marks)

A) Write short note on classification and different types of antifriction bearings. Draw neat sketches of these bearings. (5 marks)

B) Select a single row deep groove ball bearing with the operating cycle listed below, which will have a life of 15000 hours. (25 marks)

Fraction cycle	Type of load	Radial load (N)	Trust load (N)	Speed (r.p.m)	Service factor
1/10	Heavy shocks	2000	1200	400	3.0
1/10	Light shocks	1500	1000	500	1.5
1/5	Moderate shocks	1000	1500	600	2.0
3/5	No shocks	1200	2000	800	1.0

Assume radial and axial load factors to be 1.0 and 1.5 respectively and inner race rotates.

Table 27.6. Basic static and dynamic capacities of various types of radial ball bearings.

Bearing No.	Single row deep groove ball bearing		Bearing No.	Single row deep groove ball bearing		Bearing No.	Single row deep groove ball bearing		Bearing No.	Single row deep groove ball bearing	
	Static (C_0)	Dynamic (C)		Static (C_0)	Dynamic (C)		Static (C_0)	Dynamic (C)		Static (C_0)	Dynamic (C)
	(1)	(2)		(1)	(2)		(1)	(2)		(1)	(2)
200	2.24	4	206	10	15.3	211	26	34	217	55	62
300	3.60	6.3	306	14.6	22	311	42.5	56	317	88	104
201	3	5.4	406	23.2	33.5	411	60	78	417	132	134
301	4.3	7.65	207	13.7	20	212	32	40.5	218	63	75
202	3.55	6.10	307	17.6	26	312	48	64	318	98	112
302	5.20	8.80	407	30.5	43	412	67	85	418	146	146
203	4.4	7.5	208	16	22.8	213	35.5	44	219	72	85
303	6.3	10.6	308	22	32	313	55	72	319	112	120
403	11	18	408	37.5	50	413	76.5	93	220	81.5	96.5
204	6.55	10	209	18.3	25.5	214	39	48	320	132	137
304	7.65	12.5	309	30	41.5	314	63	81.5	221	93	104
404	15.6	24	409	44	60	414	102	112	321	143	143
205	7.1	11	210	21.2	27.5	215	42.5	52	222	104	112
305	10.4	16.6	310	35.5	48	315	72	90	322	166	160
405	19	28	410	50	68	415	110	120			
						216	45.5	57			
						316	80	96.5			
						416	120	127			