

Name:
Enrolment No:



UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2018

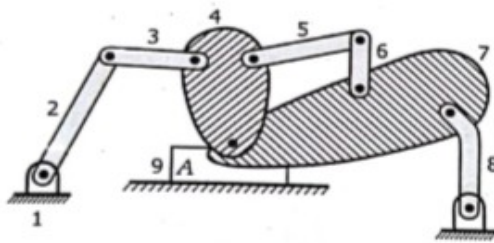
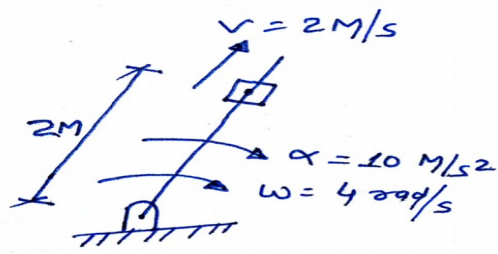
Course : Theory of Machine
Course Code : MECH 2013
Programme : B.tech ASE

Semester : III
Time : 03 hrs.
Max. Marks : 100

Instructions:

1. The Question paper has three sections: Section A, B and C.
2. Section B and C have internal choices.

SECTION A

S. No.		Marks	CO
Q 1	Determine the degree of freedom of given aircraft mechanism 	4	CO1
2	Find out the total acceleration of the given configuration 	4	C02
3	Explain the working principle of centrifugal clutch.	4	C03
4	Define the following terms used in the governors a) Height of a governor b) Equilibrium speed c) Sleeve lift d) Controlling force	4	C04
5	Define centrifugal governors with neat sketches.	4	C04

SECTION B

6	<p>A multidisc clutch has three discs on the driving shaft and two on the driven shaft. The outside diameter of the contact surface is 240 mm and inside diameter 120 mm. assuming uniform wear and coefficient of friction as 0.3. find the maximum axial intensity of pressure between the disc for transmitting 25 kW at 1575 rpm.</p> <p align="center">Or,</p> <p>A single dry plate clutch transmit 7.5 kW at 900 RPM. The axial pressure is limited to 0.07N/mm^2. If the coefficient of friction is 0.25, find the</p> <p>a) Mean radius and face width of the friction lining assuming the ratio of the mean radius to the face width as 4 and</p> <p>b) Outer and inner radii of the clutch plate</p>	10	CO4
7	<p>Determine the velocity of slider at B and D and angular velocity of CD in the following given mechanism as shown in the figure below. The crank OA rotates at 20 rpm anticlockwise and gives motion to sliding block B and D. The dimensions of the various links are OA= 300 mm AB = 1200 mm BC = 450 mm and CD = 450 mm.</p>	10	C02
8	<p>Find the required mass A and the relative angular settings of the four masses so that the shaft shall be in complete balance where A, B, C and D are four masses carried by a rotating shaft at radii 100, 125, 200 and 150 mm respectively. The plane in which the masses resolve are spaced 600 mm apart and the mass of B, C and D are 10 kg, 5 kg, and 4 kg respectively.</p>	10	CO3
9	<p>Sketch and describe the working of two different types of quick return mechanism. Give example of their application. Derive an expression for the ratio of times taken in forward and return stroke for one of these mechanism.</p>	10	CO1

SECTION-C

10	<p>Derive the expression for equilibrium speed of Proell Governor by instantaneous center method.</p> <p>Determine the range of speed of governor of a proell governor has equal arms of length 300 mm. the upper and the lower ends of the arm are pivoted on the axis of the governor. the extension arms of the lower links are each 80 mm long and parallel to the axis when the radii of rotation of the balls are 150 mm and 200 mm. the mass of each ball is 10 kg and the mass of central load is 100 kg.</p>	20	CO4
11	<p>Derive the expression of torque transmission in multiplate clutch based on uniform pressure as well as uniform wear theory and explain working of Multiplate clutches</p>	20	C03

with neat sketches.

Or

1. A shaft has number of collars integral with it . external diameter of collars is 400 mm and the shaft diameter is 250 mm. if the uniform intensity of pressure 350 Kpa and its coefficient of friction is 0.05 estimate
 - a) Power absorbed in overcoming friction when the shaft runs at 105 RPM and carries a load of 150 KN. And
 - b) Number of collar required

[10]
2. A square threaded bolt of root diameter 22.5 mm and pitch 5 mm is tightened by screwing a nut whose mean diameter of bearing surface is 50 mm. if coefficient of friction for nu and bolt is 0.1 and for nut and bearing surface 0.16 , find the force required at the end of a spanner 500 mm long when the load on the bolt is 10 kN
[10]

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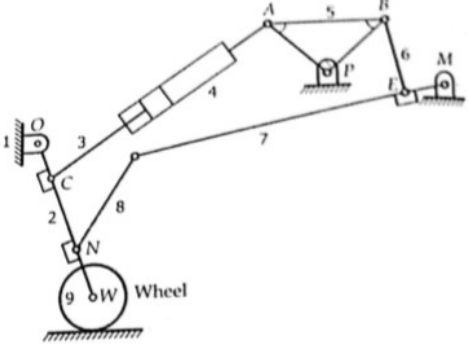
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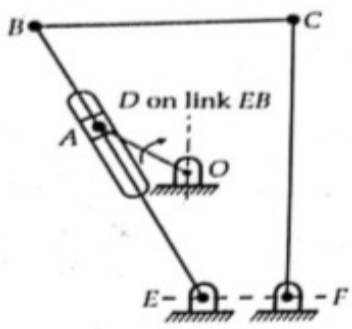
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SECTION A

S. No.		Marks	CO
Q 1	Find the degree of freedom of given aircraft mechanism 	4	CO1
2	Explain the mechanical advantage of a four bar mechanism and toggle position	4	C02
3	Discuss the following clutches with application 1) Single plate clutches 2) Multiplate clutches	4	C03
4	Sketch the following linkage system in the aircraft a) Push and pull system b) Linkage system for elevator	4	C01
5	Differentiate between flywheel and Governor.	4	C04

SECTION B

6	A friction clutch is required to transmit 30 Kw at 2000 RPM. The clutch is to be of single plate disc type with both side effective. The maximum pressure that the clutch surfaces can withstand is limited to 0.07 MPa. The outer diameter of the clutch plate is 300 mm. find the required inner diameter of the plate. Also find the total force exerted by the springs for engaging the clutch. Assume that uniform wear condition prevail and coefficient of friction is 0.3.	10	CO4
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	Or,		
	<p>The thrust of a propeller shaft in a marine engine is taken up by a number of collars integral with the shaft which is 300 mm in diameter. The thrust on the shaft is 200 kN and the speed is 75 RPM. Taking coefficient of friction equal to 0.05 and assuming intensity of pressure as uniform and equal to 0.3 N/mm^2, Find the external diameter of the collars and the number of collars required, if the power lost in friction is not to exceed 16 kW.</p>		
7	<p>Determine the velocity of the slider A and angular velocity of link BC if the crank OA rotates uniformly at 20 rad/sec clockwise, For the given mechanism with the following dimension BC= 18 cm, FC = 25 cm, OA = 7.5 cm, EB = 27 cm, EF = 6 cm angle Between EFC = 90 degree.</p> 	10	CO2
8	<p>Find the position and magnitude of the balance mass required for the four masses M_1, M_2, M_3 and M_4 having their radii of rotation as 200 mm, 150 mm, 250 mm and 300 mm are 200 kg, 300 kg, 240 kg, and 260 kg in magnitude respectively. The angle between the successive masses are $45^\circ, 75^\circ,$ and 135° respectively. If its radius of rotation is 200 mm.</p>	10	CO3
9	<p>Explain the crank and slotted lever quick return motion mechanism and find out the ratio of the time of cutting to the time of return stroke if it has center distance of 300 mm between the center of oscillation of the slotted lever and the center of rotation of the crank and the radius of the crank is 120 mm.</p>	10	CO1
SECTION-C			
10	<p>Derive the expression for the height of Porter Governor by instantaneous center method and compare this equation with watt governor and comment, which one is better.</p>	20	CO4
11	<p>Derive the expression for torque required to lift and lower the load by a screw jack with neat sketches.</p>	20	C03

Or,

- 1) The mean diameter of the screw jack having pitch of 10 mm is 50 mm. a load of 20 kN is lifted through a distance of 170 mm. find the work done in lifting the load and efficiency of the screw jack when
 - a) The load rotates with the screw and
 - b) The load rest on the loose head which does not rotate with the screwThe external and internal diameter of the bearing surface of the loose head are 60 mm and 10 mm respectively. The coefficient of friction for the screw as well as the bearing surface can be taken as 0.08.
[15]
- 2) Explain the condition of over hauling and self-locking screw.
[05]