

Branch: Mechanical Engg. (Second Year B.Tech.)
Subject with Subject Code:- Theory of Machines-I (BTMEC402)
Date:-28/11/2019

Sem.:- IV
Marks: 60
Time:- 3 Hrs.

Instructions:-

1. Figures to the right indicate full marks.
2. Clearly mention the main question number along with the sub questions.
3. Assume suitable data, if necessary.
4. All questions are compulsory.

Q.No.	Question	Marks
1	Solve any Two:	
a)	i) Describe Watt's straight line generating mechanism	2.5
	ii) Find degrees of freedom for the mechanism as shown in the Fig.1.	2.5

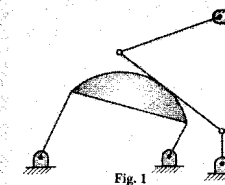


Fig. 1

- | | | |
|----|--|----|
| b) | Explain the types of constrained motions with neat sketches. | 05 |
| c) | Explain with the help of neat sketches any two inversion of double slider crank chain. | 05 |
| 2 | a) For the configuration of slider crank mechanism shown in Fig.2, Calculate the, | 06 |
| | i. acceleration of the slider at B | |
| | ii. acceleration of the point E | |
| | iii. angular acceleration of the AB | |
| | OA rotates at 20 rad/sec counter clockwise. | |

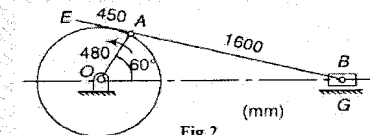


Fig.2

- | | | |
|----|--|----|
| b) | In a horizontal IC engine mechanism, the crank of length 5 cm rotates at a uniform speed of 240 rpm. The length of connecting rod is 20 cm. when the crank has turned by 30° from its inner dead centre, locate all the instantaneous centers of the mechanism & find the angular velocity of the connecting rod & also the velocity of piston | 04 |
|----|--|----|

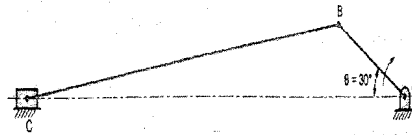


Fig.3.

- 3 Solve Any Two: 05
- A load of 15 kN is raised by means of screw jack. The mean diameter of the square threaded screw is 42 mm & the pitch is 10 mm. A force of 120 N is applied at the end of a lever to raise the load. Determine the length of lever to be used & mechanical advantage obtained. Is the screw self-locking? Take $\mu = 0.12$. 05
 - What are uniform pressure & uniform wear theories? Deduce expressions for the friction torque considering both the theories for a flat collar. 05
 - Deduce an expression for the efficiency of an inclined plane when a body moves down a plane. 05
- 4 Solve Any Two: 05
- An automotive single plate clutch consists of two pairs of contacting surfaces. The outer diameter of the friction disk is 270 mm. The coefficient of friction is 0.3 and the maximum intensity of pressure is 0.3 N/mm^2 . The clutch is transmitting a torque of 531 N-m. Assuming uniform wear theory, calculate: 05
 - the inner diameter of the friction disk; and
 - spring force required to keep the clutch engaged.
 - A brake drum of 440 mm in diameter is used in a braking system as shown in Fig.4. The brake lever is inclined at an angle of 20° with the horizontal. A vertical force of 400 N magnitude is applied at the lever end. The coefficient of friction is 0.35. The brake drum has a mass of 160 kg & it rotates at 1500 rpm. Determine the 05
 - Braking torque
 - Number of revolution made by the drum & the time taken before coming to rest from the instant of brake is applied

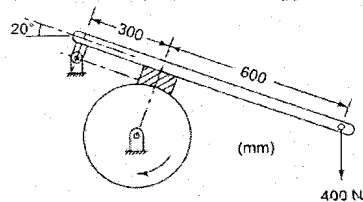


Fig.4.

- Discuss Prony brake dynamometer & Rope brake dynamometer with neat sketches. 05
- 5 a) Draw the profile of a cam operating a knife-edge follower having lift of 30 mm. The cam raises the follower with uniform acceleration & deceleration for 120° of the rotation followed by a period of dwell for 30° . The follower descends for the next 90° rotation of the cam with SHM, again followed by 08

a dwell period. The cam rotates at a uniform speed of 800 rpm & has a least radius of 30 mm. What will be the maximum velocity & acceleration of the follower during the lift & the return?

- Write various types of cams. 02
- 6 Solve Any Two: 05
- Explain the direct & reverse crank method for determining unbalanced forces in radial engines. 05
 - A three cylinder radial engine running at 1500 r.p.m. is having its axes at 120° to each other. The stroke is 120 mm & each connecting rod is 215 mm long. The mass of reciprocating parts is 3 kg per cylinder. Determine the primary & secondary unbalanced force acting on the engine. 05
 - Explain the method of balancing of several masses rotating in same planes. 05
- *****Paper End*****