



Paper id: 250786

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BTECH
(SEM VI) THEORY EXAMINATION 2024-25
THEORY OF MACHINE

TIME: 3 HRS

M.MARKS: 70

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

02 x 7 = 14

Q no.	Question	CO	Level
a.	Differentiate between lower pair and higher pair.	1	K2
b.	Define Grashof's Law.	2	K2
c.	State Kennedy's theorem.	2	K1
d.	Define pressure angle related to cam.	3	K2
e.	What do you understand by interference?	4	K2
f.	State D'Alembert's principle.	5	K1
g.	Explain the term hunting of governor.	6	K2

SECTION B

2. Attempt any three of the following:

07 x 3 = 21

a.	<p>In a slider-crank mechanism, the crank is 480 mm long and rotates at 20 rad/s in the counter-clockwise direction. The length of the connecting rod is 1.6 m. When the crank turns 60° from the inner-dead centre, determine: (i) velocity of the slider (ii) velocity of a point E located at a distance 450 mm on the connecting rod extended.</p>	2	K3
b.	What do you understand by inversions of mechanism? Describe various inversions of 4 bar chain with suitable examples.	1	K2
c.	Discuss the involute profile of gear teeth. What is the difference between involute and cycloidal form of teeth?	4	K2
d.	Four masses m_1 , m_2 , m_3 and m_4 are 200 kg, 300 kg, 240 kg and 260 kg respectively. The corresponding radii of rotation are 0.2 m, 0.15 m, 0.25 m and 0.3 m respectively and the angles between successive masses are 45°, 75° and 135°. Find the position and magnitude of the balance mass required, if its radius of rotation is 0.2 m.	5	K3
e.	What is meant by a self-locking brake? Describe the working of a band and block brake with the help of a neat sketch.	6	K3

SECTION C

3. Attempt any one part of the following:

07 x 1 = 07

a.	Explain Coriolis component of acceleration and derive the expressions for Coriolis component of acceleration.	2	K2
b.	What are the quick return mechanisms? Discuss the working and use of any one	1	K2



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	of them with neat sketch.		
4.	Attempt any one part of the following:	07 x 1 = 07	
a.	Two 20° involute spur gears mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 module. If the pinion rotates at 120 rpm, determine the (i) Minimum number of teeth on each wheel to avoid interference (ii) Contact ratio	4	K3
b.	What is the function of flywheel? Derive the expression for maximum fluctuation of energy.	4	K2
5.	Attempt any one part of the following:	07 x 1 = 07	
a.	A cam operating a knife-edged follower has the following data: (a) Follower moves outwards through 40 mm stroke during 60° of cam rotation. (b) Follower dwells for the next 45°. (c) Follower returns to its original position during next 90°. (d) Follower dwells for the rest of the rotation. The displacement of the follower is to take place with uniform acceleration and retardation during both the outward and return strokes. The least radius of the cam is 50 mm. Draw the profile of the cam when the axis of the follower passes through the cam axis.	3	K3
b.	Discuss the various types of cam and followers with neat sketch.	3	K2
6.	Attempt any one part of the following:	07 x 1 = 07	
a.	Each arm of a Porter governor is 200mm long and is pivoted on the axis of the governor. The radii of rotation of the governor ball at the minimum and the maximum speeds are 120 mm and 160 mm respectively. The mass of the sleeve is 24 kg and each ball is 4 kg. Find the range of the speed of the governor. Also determine the range of speed of the governor if the friction at the sleeve is 18 N.	6	K3
b.	Explain and derive the following expressions, for an uncoupled two-cylinder locomotive engine: (a) Variation of tractive force (b) Hammer blow.	5	K3
7.	Attempt any one part of the following:	07 x 1 = 07	
a.	The turbine of a ship has a mass of 2.2 tonnes and rotates at 1800rpm clockwise when viewed from the stern(aft). The radius of gyration of the rotor is 320 mm. Determine the gyroscopic couple and its effect when the ship turns left at a radius of 250 m with a speed of 6.9 m/s.	6	K3
b.	Differentiate between brake and dynamometer. With the help of suitable diagram, explain the rope brake dynamometer.	6	K2