Question Paper

Exam Date & Time: 20-Nov-2019 (02:00 PM - 05:00 PM)

MANIPAL ACADEMY OF HIGHER EDUCATION

INTERNATIONAL CENTRE FOR APPLIED SCIENCES
END SEMESTER THEORY EXAMINATIONS
NOVEMBER-2019
III SEMESTER B.Sc. (Applied Sciences) in Engg.
KINEMETICS OF MACHINES [IMET 232 - S2]

Marks: 100 **Duration: 180 mins.**

Answer 5 out of 8 questions.

1) A) Derive an expression for the torque in single flat collar bearing, assuming uniform wear. (10)

B) In a reduction gear shown in the Fig. Q1B, the input S has 24 teeth. P and C constitute a compound planet having 30 and 18 teeth respectively. If all the gears are of the same pitch, find the ratio of the reduction gear. Assume A to be fixed (10)

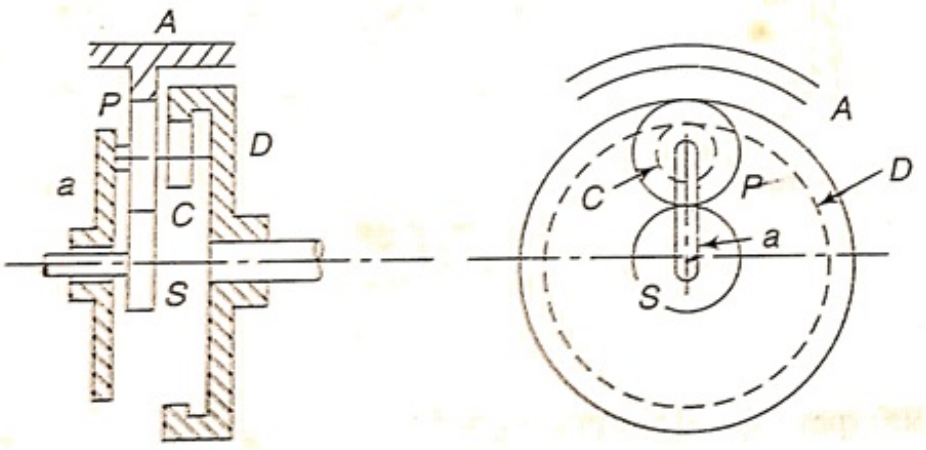

Fig Q1B. Epicyclic Gear Train

2) A) For the Mechanisms shown in the Fig Q2A(i) and Q2A(ii). Calculate the number links, joints, and degrees of freedom (10)

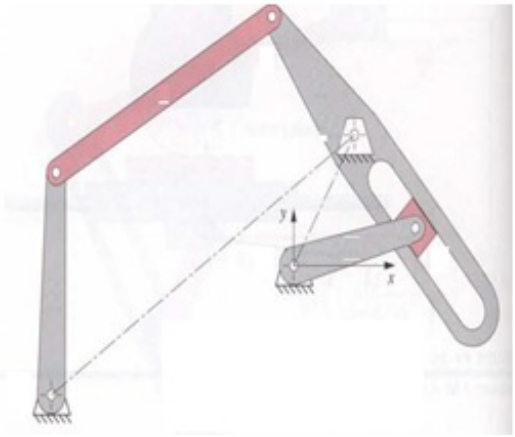

Fig Q2A (i)

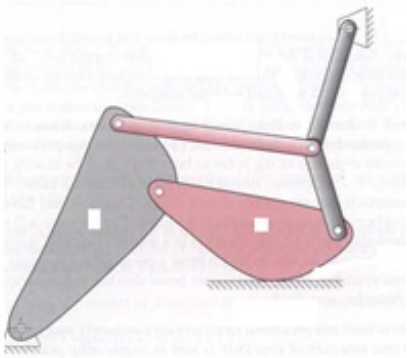

Fig Q2A(ii)

	B)	Explain the step by step procedure of constructing the velocity and acceleration diagrams for the Slider Crank Mechanism, where crank is rotating in clockwise direction.	(10)
3)		Derive an expression for arc of contact in gears.	(10)
	A)		
	B)	Briefly explain any four different types of gears.	(8)
	C)	In what way are the angular acceleration of the output link and the coupler found?	(2)
4)		What is Kutzback's criterion for degree of freedom of freedom of plane mechanisms? In what way is Grubler's criterion different from it?	(8)
	A)		
	B)	With a neat sketch explain the Geneva mechanism.	(5)
	C)	Carry out the comparison between the cycloidal and involute tooth profiles of gear.	(7)
5)		What do you mean by inversion of a mechanism? Elaborate on the inversions of double slider crank chain with examples.	(8)
	A)		
	B)	A thrust shaft of a ship has 6 collars of 600 mm external diameter and 300mm internal diameter. The total thrust from the propeller is 100 KN. If the coefficient of friction is 0.12 and speed of the engine 90 RPM, find the power absorbed in friction at the thrust block, assuming (a). Uniform pressure; and (b). Uniform wear.	(8)
	C)	Elaborate on the operation of a reverted gear train, with the aid of neat sketch.	(4)
6)		Fig. 6A. Shows an epicyclic gear train. Pinion A has 15 teeth and is rigidly fixed to the motor shaft. The wheel B has 20 teeth and gears with A and	(10)
	A)		

also with the annular fixed wheel E. Pinion C has 15 teeth and is integral with B (B, C being a compound gear wheel). Gear C meshes with annular wheel D, which is keyed to the machine shaft. The arm rotates about the same shaft on which A is fixed and carries the compound wheel B, C. If the motor runs at 1000 RPM, find the speed of the machine shaft. Find the torque exerted on the machine shaft, if the motor develops a torque of 100 N-m.

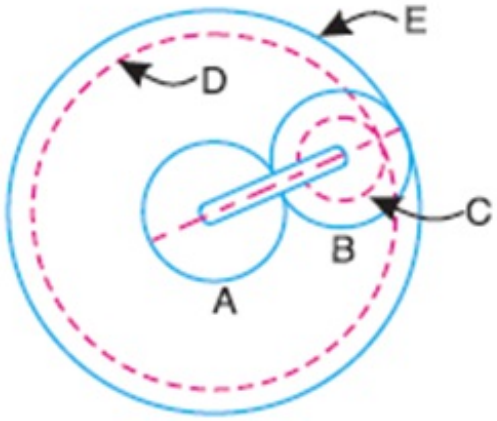

Fig. 6A : Epicyclic Gear Train.

B) Enumerate the step by step procedure of constructing the cam profile, with knife edge follower which has constant velocity and acceleration motion. (10)

7) Derive an expression for perfect steering and in detail explain the Ackerman steering gear mechanism. (10)

A)

B) In detail explain the different types of gear trains with the help of neat sketches. (10)

8) Define The following terminologies of Gear (10)
(i) Pitch Circle (ii) Pressue Angle (iii) Root Circle (iv) Module (v) Adendum

A)

B) What are the different types of constrained motion? Elaborate on each type with a suitable example. (5)

C) List out the differences between the Machine and Structure. (5)

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