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Question Bank for the Units – KINEMATICS OF MACHINERY

IVth Semester – B.E. / B.Tech.

Department of Mechanical Engineering

Part-A (10 x 2 = 20 Marks)

UNIT – I BASICS OF MECHANISMS

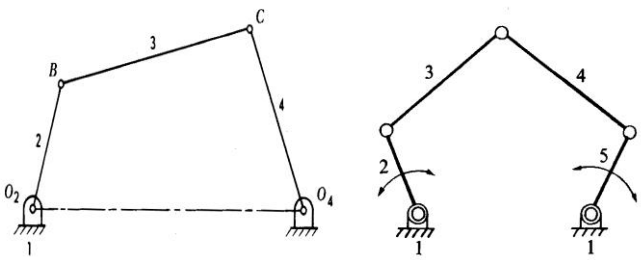
No	Question	Level	Competence	Mark
1.1	Define Kinematic pair.	L1	Remembering	2
1.2	Compare machine and structure.	L5	Evaluating	2
1.3	Define Kinematic link	L1	Remembering	2
1.4	List out few types of rocking mechanism?	LI	Remembering	2
1.5	State the types of kinematic pair.	L1	Remembering	2
1.6	Define structure?	L1	Remembering	2
1.7	Define higher pair.	L1	Remembering	
1.8	Define lower pair.	L1	Remembering	2
1.9	Define degree of freedom (or) what is mean by mobility?	L1	Remembering	2
2.1	Explain Grashoff's law	L2	Understanding	2
2.2	What is Inversion of mechanism?	L1	Remembering	2

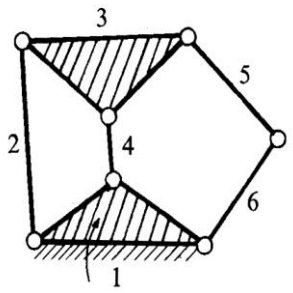
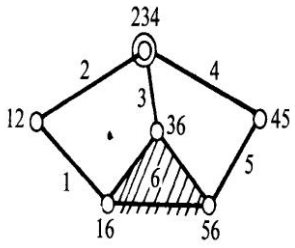
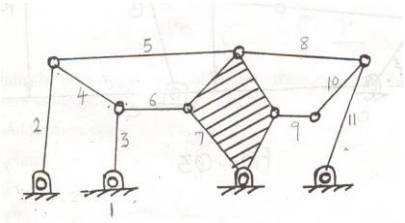
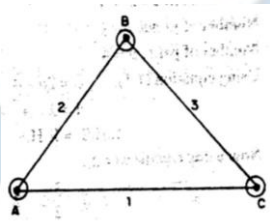
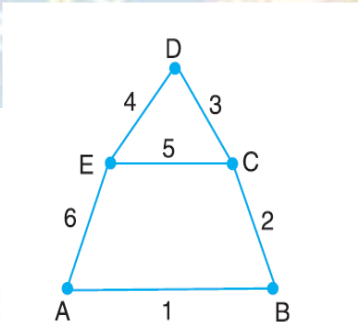
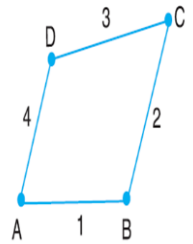
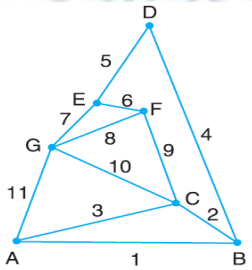
2.3	What is locked chain?	L1	Remembering	2
2.4	What is meant by 'Transmission angle'?	L1	Remembering	2
2.5	State the Kutzback criterionL1	L1	Remembering	
2.6	Classify constrained motion	L1	Remembering	2
2.7	What is Mechanical advantage in a mechanism.	L1	Remembering	2
2.8	Define pantograph?	L1	Remembering	2
2.9	When the linkage become mechanism	L2	Understanding	2
2.10	Differentiate flexible and rigid link.	L4	Analyzing	2
UNIT – II **KINEMATICS OF LINKAGE MECHANISMS**				
3.1	What is the magnitude of linear velocity of a point B on a link AB relative to A?	L1	Remembering	2
3.2	What are the expression for radial and tangential component of acceleration?	L1	Remembering	2
3.3	Define rubbing velocity. What will be the expression for rubbing velocity at a pin joint when the two links rotate in opposite direction?	L1	Remembering	2
3.4	What are the different methods used for finding the velocity?	L1	Remembering	2
3.5	What is a coincident point?	L1	Remembering	2
3.6	What is configuration or space diagram? What is the use?	L1	Remembering	2
3.7	Name any two mechanisms having Coriolis component of acceleration.	L1	Remembering	2
3.8	What is the total number of instantaneous centres that are possible for a mechanism consisting 'n' links	L1	Remembering	2

4.1	State the condition for a link to experience Coriolis acceleration	L1	Remembering	2
4.2	Define instantaneous centre and instantaneous axis.	L1	Remembering	2
4.3	What is the expression for Coriolis component of acceleration?	L1	Remembering	2
4.4	Define Kennedy's theorem.	L1	Remembering	2
4.5	What is meant by virtual centre?	L1	Remembering	2
4.6	Explain radial or normal component of acceleration.	L2	Understanding	2
4.7	Explain the types of instantaneous centre.	L2	Understanding	2
UNIT – III KINEMATICS OF CAM MECHANISMS				
5.1	What are the different motions of the follower?	L1	Remembering	2
5.2	What are the advantages of roller follower than knife edge follower?	L1	Remembering	2
5.3	Define angle of dwell	L1	Remembering	2
5.4	Define under cutting in a cam mechanism.	L1	Remembering	2
5.5	What is a cam? Give some examples for cams.	L1	Remembering	2
5.6	Distinguish radial and cylindrical cams.	L2	Understanding	2
5.7	Define pressure angle with respect to cams.	L1	Remembering	
5.8	What is prime circle of a cam? What is the radial distance between the prime circle and base circle for a cam?	L1	Remembering	2
5.9	Define Lift (or) Stroke in cam.	L1	Remembering	2

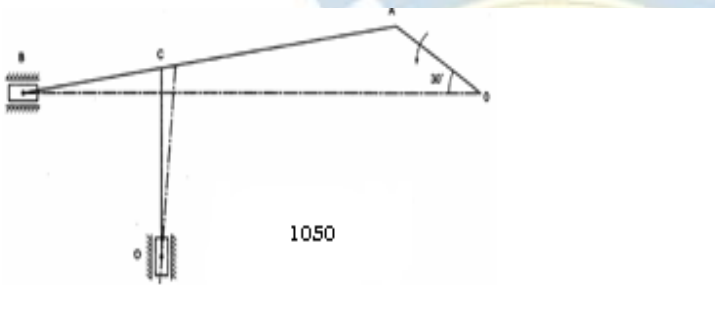
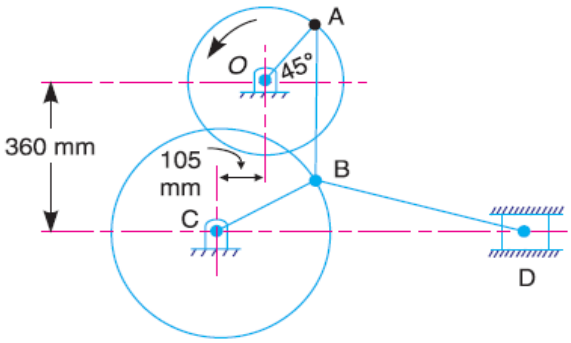
6.1	What is radial or disc cam	L1	Remembering	2
6.2	Define the term jump speed of a cam	L1	Remembering	2
6.3	State the reasons for providing offset in a cam follower mechanism.	L1	Remembering	2
6.4	Define tangent cam.	L1	Remembering	2
6.5	How can you prevent undercutting in cam	L2	Understanding	2
6.6	State the expression for maximum velocity and acceleration of follower moving with cycloidal motion.	L1	Remembering	2
6.7	Draw any four types of cam with followers.	L1	Remembering	2
6.8	Why some times axis of translating roller followers in cam follower mechanisms are offset from axis of rotation of cam.	L2	Understanding	2
6.9	State the advantages of cam mechanisms over linkage mechanisms	L1	Remembering	2
UNIT – IV **GERAS AND GEAR TRAINS**				
7.1	What are the advantages of epicyclic gear train?	L1	Remembering	2
7.2	State the law of gearing	L1	Remembering	
7.3	List down the common forms of teeth.	L1	Remembering	2
7.4	Define module of gear.	L1	Remembering	2
7.5	What is meant by speed ratio and Train value	L1	Remembering	2
7.6	What is an angle of obliquity in gears?	L1	Remembering	2
7.7	Define gear ratio	L1	Remembering	2
7.8	Define circular pitch	L1	Remembering	2

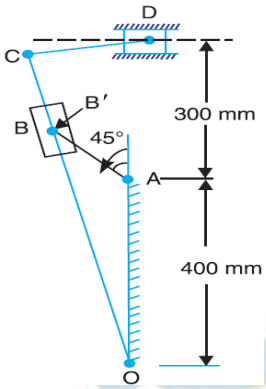
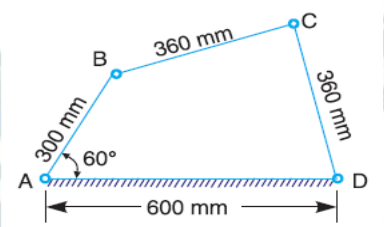
8.1	What is meant by interference and undercutting of Gears?	L1	Remembering	2
8.2	What is the advantage when arc of recess is equal to arc of approach in meshing gears?	L1	Remembering	2
8.3	What is the role of idle gears in gear trains?	L1	Remembering	2
8.4	Write short notes on differentials.	L2	Understanding	2
8.5	Define the term arc of contact in gears.	L1	Remembering	2
8.6	Explain briefly the use of differential in automobile.	L2	Understanding	2
8.7	What is reverted gear train?	L1	Remembering	2
8.8	What is epicyclic gear train? Give example.	L1	Remembering	2
	UNIT – V **FRICTION IN MACHINE ELEMENTS**			
9.1	state the law of belting	L1	Remembering	2
9.2	List down the laws of friction.	L1	Remembering	2
9.3	What are the functions of clutch?	L1	Remembering	2
9.4	Differentiate multiple & cone clutch.	L4	Analyzing	2
9.5	What is meant by self locking & self energized brakes	L1	Remembering	2
9.6	State the condition and the question for the velocity of the belt for the transmission of power in flat drive.	L1	Remembering	2
9.7	State the functional difference between clutch and brake.	L1	Remembering	2
9.8	What is slip and creep of a belt.	L1	Remembering	2
9.9	Define friction	L1	Remembering	2

9.10	What is meant by limiting angle of friction.	L1	Remembering	2
				2
10.1	What is meant by limiting angle of repose.	L1	Remembering	2
10.2	What is meant by co-efficient of friction	L1	Remembering	2
10.3	State the laws of dry friction.	L1	Remembering	2
10.4	What is the condition for self locking screws	L1	Remembering	2
10.5	What are the advantages of wire ropes over fabric ropes?	L1	Remembering	2
10.6	List out any four desirable characteristics of brake lining material.	L1	Remembering	2
10.7	Distinguish between sliding and rolling friction.	L4	Analyzing	2
10.8	What are the advantages of V – belt drive.	L1	Remembering	2
Part – B (5 x 13 = 65 Marks)				
UNIT- I BASICS OF MECHANISMS				
11.a-1	Explain the types of kinematic pairs with suitable sketches Explain the types of joints in a chain.	L2	Understanding	(7) (6)
11.a-2	Explain the types of constrained motion with neat sketch	L2	Understanding	(7)
11.a-3	Find degrees freedom of the mechanisms shown in fig 	L5	Evaluating	(13)

	  			
11.a-4	Explain beam engine with neat sketch. Explain Scotch yoke mechanism with neat sketch.	L2	Understanding	
11.a-5	Find the given fig is kinematic chain or locked chain    	L5	Evaluating	
11.a-6	Explain the inversion of single slider crank mechanism with suitable sketches	L2	Understanding	(13)
11.b-1	Describe the inversion of four bar mechanism with suitable sketches.	L2	Understanding	(13)
11.b-2	With the help of a neat sketch explain the working of crank and lever quick return mechanisms. Derive an expression	L2	Understanding	(13)

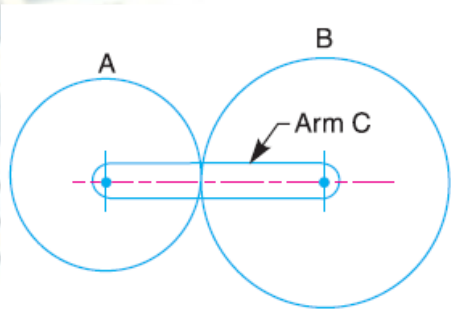
	for the ratio of time taken in forward and return stroke.			
11.b-3	With the help of a neat sketch explain the working of whith worth quick return mechanisms. Derive an expression for the ratio of time taken in forward and return stroke.	L2	Understanding	(13)
11.b-4	Sketch and explain inversions of a double slider crank chain.	L2	Understanding	(13)
11.b-5	With neat sketches explain any two straight line mechanism.	L2	Understanding	(13)
11.b-6	Explain briefly i. Mechanical advantage ii. Transmission angle	L2	Understanding	(6)
UNIT – II **KINEMATICS OF LINKAGE MECHANISMS**				
12.a-1	PQRS is a four bar chain with link PS fixed the length of the links , PQ=62.5mm, QR=175m RS=112.5mm, PS=200mm.If the crank PQ rotates at 10 rad/sec clockwise direction. Draw the velocity and acceleration diagram when angle QPS=60^0 and Q and R lie on the same side of PS. Find the angular velocity of links QR and RS.	L4	Analyzing	(13)
12.a-2	In a four link mechanism, the crank AB rotates at 36rad/sec. The lengths of the links are AB = 200mm, BC = 400mm, CD = 450mm and AD=600mm. AD is the fixed link. At the instant when AB is at right angle to AD. Determine the velocity and acceleration at the midpoint of link BC.	L4	Analyzing	(13)
12.a-3	In a slider crank mechanism, the length of crank OB and connecting rod AB are 125mm and 500mm respectively. The centre of gravity of the connecting rod is 250mm from the slider A. the crank speed is 600rpm clockwise. When the crank has turned 45^0 from the inner dead centre position, determine a. Linear velocity and acceleration of the midpoint of the connecting rod and b. Angular velocity and angular acceleration of the connecting rod.	L4	Analyzing	(13)
12.a-4	An engine mechanism is shown in Fig. The crank CB = 100 mm and the connecting rod BA = 300 mm with centre of gravity G, 100 mm from B. In the position shown, the crankshaft has a speed of 75 rad/s and an angular acceleration of 1200 rad/s2. Find:1. velocity of	L4	Analyzing	(13)

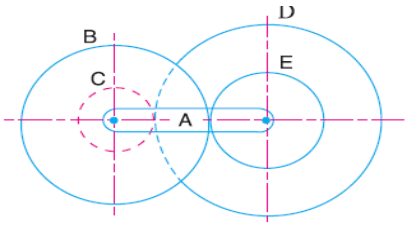
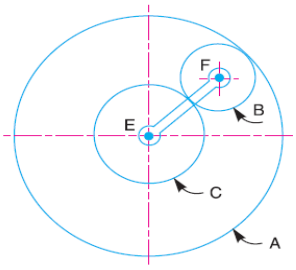
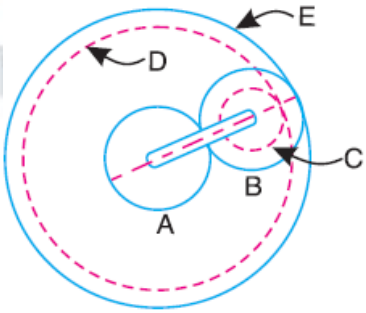
	G and angular velocity of AB, and 2. acceleration of G and angular acceleration of AB.  			
12.b-1	The dimensions of the various links of a mechanism, as shown in fig. are as follows: OA=300 mm; AB=1200; BC=450 mm and CD=450 mm. if the crank OA rotates at 20 r.p.m. in the anticlockwise direction and gives motion to the sliding blocks B and D, find, for given configuration: (1) Velocity of sliding at B and D, (2) Angular velocity of CD (3) Linear acceleration of D and (4) angular acceleration of CD.  	L4	Analyzing	(13)
12.b-2	In the toggle mechanism shown in Fig. 8.16, the slider D is constrained to move on a horizontal path. The crank OA is rotating in the counter-clockwise direction at a speed of 180 r.p.m. increasing at the rate of 50 rad/s2. The dimensions of the various links are as follows: OA = 180 mm ; CB = 240 mm ; AB = 360 mm ; and BD = 540 mm. For the given configuration, find **1.** Velocity of slider D and angular velocity of BD, and **2.** Acceleration of slider D and angular acceleration of BD  	L4	Analyzing	(13)

12.b-3	A mechanism of a crank and slotted lever quick return motion is shown in the Fig. If the crank rotates counter clockwise at 120 r.p.m., determine for the configuration shown, the velocity and acceleration of the ram D. Also determine the angular acceleration of the slotted lever. Crank, AB = 150 mm ; Slotted arm, OC = 700 mm and link CD = 200 mm.  	L4	Analyzing	(13)
12.b-4	In a pin jointed four bar mechanism, as shown in Fig. AB = 300 mm, BC = CD = 360 mm, and AD = 600 mm. The angle BAD = 60°. The crank AB rotates uniformly at 100 r.p.m. Locate all the instantaneous centres and find the angular velocity of the link BC  	L4	Analyzing	(13)
UNIT – III	**KINEMATICS OF CAM MECHANISMS**			
13.a-1	A cam rotating clockwise with a uniform speed is to give the roller follower of 20mm diameter with the following motion. i. Follower to move outwards through a distance of 30mm during 120^0 of cam rotation. ii. Follower to dwell for 60^0 of cam rotation iii. follower to return to its initial position during 90^0 of cam rotation and iv. follower to dwell for the remaining 90^0 of cam rotation. The minimum radius of cam is 45mm and the displacement of the follower is to take place with SHM on both the outward & return strokes. Draw the cam profile when The line of stroke is offset by 15mm from the axis of the cam.	L6	Creating	(13)

13.a-2	Draw the profile of cam when the roller follower moves with cycloidal motion as given below: (a) out stroke with maximum displacement of 44mm during 180^0 of the cam rotation. (b) Return stroke for the next150^0 of the cam rotation. (c) Dwell for the remaining 30^0 of cam rotation. The minimum radius of the cam is 20mm and the diameter of the roller is 10mm. The axis of the roller follower passes through the cam shaft axis	L6	Creating	(13)
13.a-3	A roller follower cam with a roller diameter of 10mm is rotating clockwise. The lift of the cam is 30mm & the axis of the follower is offset to the right by a distance of 5mm. The follower completes the lift with SHM during 120^0 of cam rotation. The dwell at lift is 60^0 of cam rotation. First half of the fall takes place with constant velocity and second half with constant acceleration and retardation during 120^0 of the cam rotation. The rest is the dwell at fall. Draw the cam profile giving details of construction and dimensions.	L6	Creating	(13)
13.a-4	A cam rotating clockwise at a uniform speed of 1000 rpm, is required to give a roller follower, the motion as described below: (a) Follower to move outward through 50 mm during 120° of a cam rotation; (b) Follower to dwell for the next 60° (c) Follower to return its original position during next 90° (d)Follower to dwell for the rest of cam rotation. The minimum radius of the cam is 50 mm and the diameter of the roller is 10mm. The axis of the follower is offset by 15 mm from the axis of the cam shaft. If the displacement of the follower takes place with uniform and equal acceleration and retardation on both the outward stroke and return stroke. Draw the profile of the cam and determine the maximum velocity and acceleration during the outward stroke and return stroke.	L6	Creating	(13)
13.b-1	Draw the profile of a cam operating a Knife-edged follower from the following data: (a) Follower to move outward through 40 mm during 60° of a cam rotation; (b) Follower to dwell for the next 45° (c) Follower to return its original position during next 90° (d)Follower to dwell for the rest of cam rotation. The displacement of the follower is to take place with simple harmonic motion during both the outward and return strokes. The least radius of the cam is 50mm. If the cam	L6	Creating	(13)

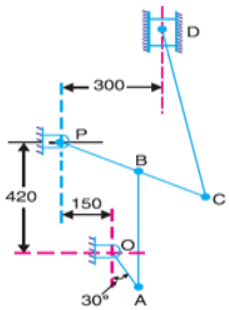
	rotates at 300 r.p.m., determine the maximum velocity and acceleration of the follower during the outward stroke and return stroke			
13.b-2	Design a cam for operating the exhaust valve of an oil engine. It is required to give Uniform acceleration and uniform retardation during opening and closing of the valve each of which corresponds to 600 of cam rotation. The valve must remain in the fully open position for 200 of cam rotation. The lift of the valve is 37.5 mm and the least radius of the cam is 40mm. The follower is provided with a roller follower of radius 20mm and the line of stroke of the follower passes through the axis of the cam	L6	Creating	(13)
13.b-3	A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed, is required to give a roller follower, at the end of a valve rod the motion as described below: (a) To raise the valve 50 mm during 120° rotation of the cam; (b)To keep the valve fully raised for next 30° (c) To lower the valve during next 60 ° and (d) To keep the valve closed during the rest period of revolution Draw the profile of the cam (i) When the line of stroke of the follower passes through the centre of the cam shaft. The displacement of the valve, while being raised or lowered is to take place with simple harmonic motion. Determine the maximum acceleration of the valve rod when the cam shaft rotates at 100 r.p.m.	L6	Creating	(13)
13.b-4	A cam drives a flat reciprocating follower in the following manner : During first 120° rotation of the cam, follower moves outwards through a distance of 20 mm with simple harmonic motion. The follower dwells during next 30° of cam rotation. During next 120° of cam rotation, the follower moves inwards with simple harmonic motion. The follower dwells for the next 90° of cam rotation. The minimum radius of the cam is 25 mm. Draw the profile of the cam.	L6	Creating	(13)
	UNIT- IV GERAS AND GEAR TRAINS			
14.a-1	Derive the expression to determine the length of path of contact between two spur gears of different size	L3	Applying	(13)
14.a-2	A pair 20^0 full depth involute gear having 30 and 50 teeth respectively of module 4mm and are mesh, the smaller gear rotates at 1000 rpm. Determine (i) sliding velocities	L4	Analyzing	(13)

	engagement and disengagement of a pair of teeth and (ii) contact ratio			
14.a-3	Two mating gears have 20 and 40 involute teeth of module is 10 mm and 200 pressure angle. The addendum on each wheel is to be made of such a length that the line of contact on each side of the pitch point has half the maximum possible length. Determine the addendum height for each wheel, the length of path of contact, arc of contact and the contact ratio.	L4	Analyzing	(13)
14.a-4	A pinion having 30 teeth drives a gear having 80 teeth. The profile of the gears is involute with 20^0 pressure angle, Module is 12 mm and the addendum is10mm. Find the length of path of contact, arc of contact and the contact ratio.	L4	Analyzing	(13)
14 .a-5	The pressure Angle of two gears is 20^0 and has a module of 10mm. the number of teeth on pinion is 24 and is on gear 60.The addendum of pardon and gear is same and equal to one module. Determine (i) the number of pairs of teeth in contact (ii) the angle of action of pinion and gear and the ratio of sliding to rolling velocity at the beginning of contact.	L4	Analyzing	(13)
14.b-1	In an epicyclic gear train, an arm carries two gears A and B having 36 and 45 teeth respectively. If the arm rotates at 150 rpm in the anticlockwise direction about the centre of gear A which is fixed, determine the speed of gear B. If the gear A instead of being fixed makes 300rpm in the clockwise direction, what will be the speed of gear B? 	L4	Analyzing	(13)
14.b-2	In a reverted epicyclic gear train, an arm A carries two gears B and C and compound gear D –E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B,C and D are 75,30 and 90 respectively. Determine the speed and direction of gear C when gear B is fixed and arm A makes 100rpm in the clockwise direction	L4	Analyzing	(13)

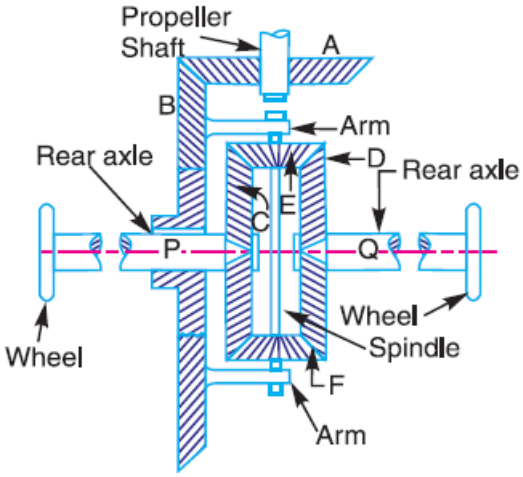
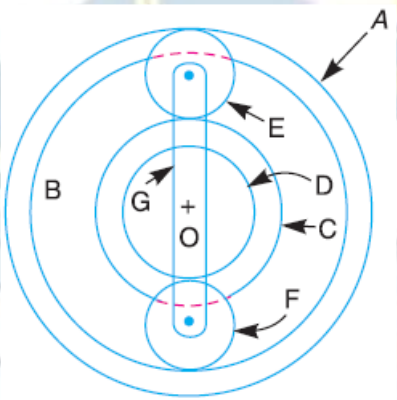
				
14.b-3	An epicyclic gear train consists of three gears A,B and C as shown in fig. The gear A has 72 internal teeth and gear C has 32 external teeth. The gear B meshes with both A and C is carried on an arm EF which rotates about the Centre of A at 18rpm. If the gear A is fixed determine the speed of gears B and C 	L4	Analyzing	(13)
14.b-4	In an epicyclic gear train shown in Fig, the pinion A has 15 teeth and is rigidly fixed in the motor shaft. The wheel B has 20 teeth and gears with A and also with annular fixed wheel E. Pinion C has 15 teeth and is integral with B (C,B 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. 	L4	Analyzing	(13)
	UNIT- V FRICTION IN MACHINE ELEMENTS			
15.a-1	Two pulleys one 450mm diameter and the other 200mm diameter are parallel shafts 2.1m apart and connected by a belt as a cross belt drive. The larger pulley rotates at 225rpm. The maximum permissible tension in the belt is 1KN and co-efficient of friction between belt and the	L4	Analyzing	(13)

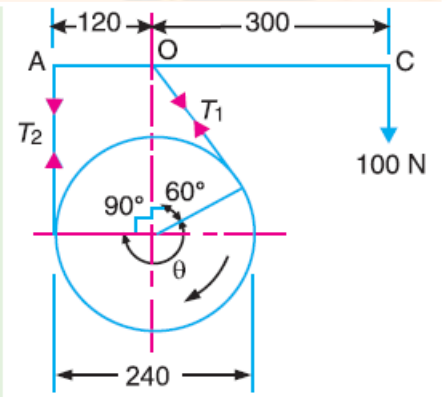
	pulley is 0.25. find the power that can be transmitted.			
15.a-2	In a simple band brake, one end of the band is attached to the fulcrum of a leaver. The other end is attached at a distance of 'b' from the fulcrum. The effort is applied at the end of the lever. Drive an expression for braking torque in terms of the effort.	L4	Analyzing	(13)
15.a-3	A single plate clutch with both side effective has outer and inner diameters 300mm & 200mm respectively. The maximum intensity of pressure at any point in the contact surface is not to be exceed 0.1 N/mm^2. If the co-efficient of friction is 0.3. Determine the power transmitted by a clutch at a speed 2500rpm for two types of assumptions that is for uniform pressure and uniform wear. Find the power transmitted by a belt running over a pulley 700mm diameter at 300rpm. co-efficient of friction is 0.3 and angle of lap 160^0 and maximum tension in the belt is 2.453KN	L4	Analyzing	(13)
15.a-4	The pulley is used to transmit power by means of ropes has a diameter of 3.6 meters and has grooves of 45^0 angle. The angle of constant is 170^0 and the coefficient of friction between the ropes and the groove sides is 0.28. the maximum possible tension in the ropes is 960N and the mass of rope is 1.5kg per meter length. What is the speed of pulley in rpm and the power transmitted if the condition of maximum power prevails.	L4	Analyzing	(13)
15.a-5	An open belt drive connects two pulleys 1.2m and 0.5m diameter, on parallel shafts 4m apart. The mass of the belt is 0.9kg per meter length and the maximum tension is not to exceed 2000N. The coefficient of friction is 0.3. the 1.2m pulley, which is he driver, runs at 200rpm. Due to belt slip on one of the pulleys the velocity of the driven shaft is only 450 rpm. Calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?	L4	Analyzing	(13)
15.b-1	A single plate clutch with effective both sides, is required to transmit 25kW at 3000rpm. Determine the outer & inner radii of frictional surface if the coefficient of friction is 0.255, the ratio of radii is 1.25 and the maximum pressure is not to exceed 0.1N/mm2. Also determine the axial thrust to be provided by springs. Assume the theory of uniform wear.	L4	Analyzing	(13)

15.b-2	A multiplate friction clutch is required to transmit 89.52kW at 3000rpm. The plates are alternately of steel and phosphor bronze and they run in oil. The coefficient of friction is 0.08. The internal radius of the friction surface is 0.8 times the radius of the external surface. The axial pressure is limited to 20 * 104 N/m2. If the maximum diameter of the frictional surfaces is not to exceed 250mm, determine the number of plates required	L4	Analyzing	(13)
15.b-3	A conical pivot supports a load of 25KN, the cone angle being $120^{0,}$ and the intensity of normal pressure does not exceed 0.25MPa. The external radius is twice the internal diameter. Find the outer and inner radius of bearing surface. If the shaft rotates at 180 rpm and co efficient of friction is 0.15, find the power load is friction assuming uniform pressure.	L4	Analyzing	(13)
15.b-4	Two pulleys one 450mm diameter and the other 200mm diameter are parallel shafts 2.1m apart and are connected by a crossed belt. The larger pulley rotates at 225 rpm. The maximum permissible tension in the belt is 1KN and the co-efficient of friction between the belt and pulley is 0.25, find the length of the belt required and the power that can be transmitted	L4	Analyzing	(13)
Part-c (1 x15 = 15 Marks)				
UNIT-I				
16.a-1	What is meant by inversion of a chain? Sketch and explain various four bar mechanism with applications.	L1	Remembering	(13)
16.a-2	Perform the kinematic analysis of the following exact straight line motion mechanisms.	L3	Applying	(13)
16.b-1	What is degree of freedom of a mechanism? How it is determined? Explain any two with examples.	L1	Remembering	(13)
16.b-2	What are quick return mechanisms? Where they are used? Discuss any one of them.	L1	Remembering	(13)
UNIT-II				
17.a -1	In a slider crank mechanism, the crank is 0.5 m long and rotates 180 rpm in clockwise direction. The length of connecting rod is 2 m. When the crank turned45^0 from the	L4	Analyzing	(13)

	inner dead centre position, find (i) Velocity of piston (ii) Angular velocity of connecting rod (iii) Velocity of point E on the connecting rod 1.5 m from the gudgeon pin. (iv) Find angular acceleration of connecting rod.			
17.a -2	Find out the acceleration slider D and angular acceleration of the link CD for the mechanism, as shown in fig. The crank OA rotates uniformly at 180 r.p.m. in the clockwise direction. The various lengths are OA=150 mm; AB=450 mm; PB=240 mm BC= 210mm and CD=660 mm.  All dimensions in mm.	L4	Analyzing	(13)
17.b -1	Derive the expressions for the velocity and acceleration of the piston of a reciprocating engine mechanism	L3	Applying	(13)
17.b -2	The dimensions and configuration of the four bar mechanism, shown in Fig. , are as follows : P_1A = 300 mm; P_2B = 360 mm; AB = 360mm, and P_1P_2 = 600 mm. The angle AP_1P_2 = 60°. The crank P1A has an angular velocity of 10 rad/s and an angular acceleration of 30 rad/s2, both clockwise. Determine the angular velocities and angular accelerations of P_2B, and AB and the velocity and acceleration of the joint B.	L4	Analyzing	(13)
	UNIT-III			
18.a -1	What are the different types of motion with which a follower can move? Why a roller follower is preferred to that of knife edge follower?	L1	Remembering	
18.a -2	Draw the velocity and acceleration diagrams for a follower when it moves with simple harmonic motion. Derive the expression for velocity and acceleration during out stroke and return stroke of the follower.	L4	Analyzing	

18.b-1	Draw the profile of the cam when the roller follower moves with cycloidal motion during out stroke and return stroke, as given below : 1. Out stroke with maximum displacement of 31.4 mm during 180° of cam rotation, 2. Return stroke for the next 150° of cam rotation, 3. Dwell for the remaining 30° of cam rotation. The minimum radius of the cam is 15 mm and the roller diameter of the follower is 10 mm. The axis of the roller follower is offset by 10 mm towards right from the axis of cam shaft.	L6	Creating	
18.b -2	It is required to set out the profile of a cam to give the following motion to the reciprocating follower with a flat mushroom contact face : (i) Follower to have a stroke of 20 mm during 120° of cam rotation ; (ii) Follower to dwell for 30° of cam rotation ; (iii) Follower to return to its initial position during 120° of cam rotation ; and (iv) Follower to dwell for remaining 90° of cam rotation. The minimum radius of the cam is 25 mm. The out stroke of the follower is performed with simple harmonic motion and the return stroke with equal uniform acceleration and retardation.	L6	Creating	
	UNI – IV			
19.a-1	Two gear wheels mesh externally to give a velocity ratio of 3 to 1. The involute tooth has 6 mm module and 20° pressure angle. Addendum is equal to one module. The pinion rotates at 90 rpm. Determine (i) Number of teeth on pinion to avoid interference and the corresponding number on the wheel (ii) The length of path and are of contact (iii) Contact ratio and (iv) The maximum velocity of sliding.	L4	Analyzing	(13)
19.a -2	Explain the nomenclature of spur gear with neat sketch.	L2	Understanding	
19.b-1	Fig shows a differential gear used in a motor car. The pinion A on the propeller shaft has 12 teeth and gears with the crown gear B which has 60 teeth. The shafts P and Q form the rear axles to which the road wheels are attached. If the propeller shaft rotates at 1000 r.p.m. and the road wheel attached to axle Q has a speed of 210 r.p.m. while taking a turn, find the speed of road wheel attached to axle P.	L4	Analyzing	(13)

				
19.b -2	In an epicyclic gear train the internal wheels A and B and compound wheels C and D rotate independently about axis O. The wheels E and F rotate on pins fixed to the arm G. E gears with A and C. Wheel F gear with B and D. All the wheels have the same module and the number of teeth are TC =28 TD=26; TE = TF=18. (1) Find the number of teeth on A and B, (2)If the arm G makes 100 rpm clockwise and A is fixed, find the speed of B , and (3) If the arm G makes 100 rpm clockwise and wheel A makes 10 rpm counter clockwise; Find the speed of wheel B. 	L4	Analyzing	(13)
	UNIT – V			
19.a-1	A 150 mm diameter valve, against which a steam pressure of 2 MN/m2 is acting, is closed by means of a square threaded screw 50 mm in external diameter with 6 mm pitch. If the coefficient of friction is 0.12 find the torque required to turn the handle.	L4	Analyzing	(13)
19.a -2	The pitch of 50 mm mean diameter threaded screw of a screw jack is 12.5 mm. The coefficient of friction between the screw and the nut is 0.13. Determine the torque required on the screw to raise a load of 25 kN, assuming the load to	L4	Analyzing	(13)

	rotate with the screw. Determine the ratio of the torque required to raise the load to the torque required to lower the load and also the efficiency of the machine.			
19.a-3	A multiple disc clutch has five plates having four pairs of active friction surfaces. If the intensity of pressure is not to exceed 0.127 N/mm2, find the power transmitted at 500 r.p.m. The outer and inner radii of friction surfaces are 125 mm and 75 mm respectively. Assume uniform wear and take coefficient of friction = 0.3.	L4	Analyzing	(13)
19.b-1	A pulley is driven by a flat belt, the angle of lap being 120°. The belt is 100 mm wide by 6 mm thick and density1000 kg/m3. If the coefficient of friction is 0.3 and the maximum stress in the belt is not to exceed 2 MPa, find the greatest power which the belt can transmit and the corresponding speed of the belt.	L4	Analyzing	(13)
19.b -2	The simple band brake, as shown in Fig. is applied to a shaft carrying a flywheel of mass 400 kg. The radius of gyration of the flywheel is 450 mm and runs at 300 r.p.m. If the coefficient of friction is 0.2 and the brake drum diameter is 240 mm, find : 1. the torque applied due to a hand load of 100 N, 2. the number of turns of the wheel before it is brought to rest, and 3. the time required to bring it to rest, from the moment of the application of the brake.  All dimensions in mm.	L4	Analyzing	(13)

L1: Knowledge, L2: Comprehension, L3: Application, L4: Analysis, L5: Evaluation, L6: Synthesis

QUESTION BANK SUMMARY

S.NO	UNIT	DETAILS	L1	L2	L3	L4	L5	L6	TOTAL
1	Unit-1	PART-A	15	2	-	1	1	-	19
		PART-B	-	10	-	-	2	-	12
		PART-C	3	-	1	-	-	-	4
2	Unit-2	PART-A	13	2	-	-	-	-	15
		PART-B	-	-	-	8	-	-	8
		PART-C	-	-	1	3	-	-	4
3	Unit-3	PART-A	14	3	-	-	-	-	17
		PART-B	-	-	-	-	-	8	8
		PART-C	1	-	-	1	-	2	4
4	Unit-4	PART-A	14	2	-	-	-	-	16
		PART-B	-	-	1	3	-	-	4
		PART-C	-	1	-	3	-	-	4
5	Unit-5	PART-A	16	-	-	2	-	-	18
		PART-B	-	-	-	9	-	-	9
		PART-C	-	-	-	5	-	-	5

Total No of Questions	PART-A	PART-B	PART-C	TOTAL
	85	46	21	152

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