

THE KAVERY ENGINEERING COLLEGE*(An Autonomous Institution)***B.E/B.TECH DEGREE END SEMESTER THEORY EXAMINATIONS, NOV /DEC 2024***Fourth Semester**Mechanical Engineering***ME3491 – Theory of Machines****(Common to Third Semester Agricultural Engineering)***Regulations – 2021**Duration : 3 Hrs**Maximum : 100 Marks***PART – A (ANSWER ALL QUESTIONS) (Marks 10*2=20)**

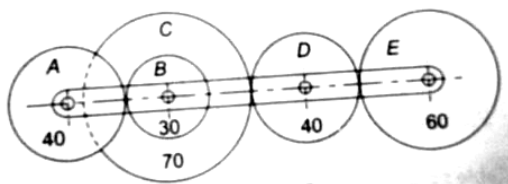
<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
1.	Name any two inversions of single slider crank chain.	RE	1	2
2.	When a linkage becomes mechanism?	UN	1	2
3.	State the two important similarities of a spur gear pair and helical gear pair.	RE	2	2
4.	What do you mean by spiral gears and hypoid gears?	UN	2	2
5.	Define lead and pitch of a screw thread.	UN	3	2
6.	State the two assumptions based on which the bearings are designed.	UN	3	2
7.	Give examples of applied forces.	RE	4	2
8.	State 'D' Alembert's principle.	RE	4	2
9.	List the applications of damper.	UN	5	2
10.	Differentiate between static and dynamic balancing.	UN	5	2

PART – B (ANSWER ALL QUESTIONS) (Marks 5*13 = 65)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
11.	a Describe with neat sketch, the mechanism obtained by the inversion of four bar chain.	UN	1	13
	Or			
	b 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.	UN	1	13
12.	a Two spur gears have a velocity ratio of 1/3. The driven gear has 72 teeth of 8 mm module and rotates at 300 rpm. Calculate the number of teeth and the speed of the driver. What will be the pitch line velocities?	AP	2	13

Or

- b A gear train in which gears B and C constitute a compound gear. The number of teeth are shown along with each wheel in the figure. Determine the speed and the direction of rotation of wheels A and E if the arm revolves at 210 rpm clockwise and the gear D is fixed.



13. a A single plate clutch (both sides effective) is required to transmit 26.5 kW at 1600 r.p.m. The outer diameter of the plate is limited to 300 mm and intensity of pressure between the plates is not to exceed 68.5 kN/m². Assuming uniform wear and a coefficient of friction 0.3, show that the inner diameter of the plates is approximately 90 mm.

Or

- b An open belt drive connects two pulleys 1.2 m and 0.5 m diameter, on parallel shafts 4 meters apart. The mass of the belt is 0.9 kg per meter length and the maximum tension is not to exceed 2000 N. The coefficient of friction is 0.3. The 1.2 m pulley, which is the driver, runs at 200 r.p.m. Due to belt slip on one of the pulleys, the velocity of the driven shaft is only 450 r.p.m. Calculate the torque on each of the two shafts, the power transmitted, and power lost in friction. What is the efficiency of the drive?

14. a Find the inertia force for the following data of an I.C. engine. Bore = 175 mm, stroke = 200 mm, engine speed = 500 r.p.m., length of connecting rod = 400 mm, crank angle = 60° from T.D.C and mass of reciprocating parts = 180 kg.

Or

- b The length of crank and connecting rod of a horizontal engine are 200 mm and 1 m respectively. The crank is rotating at 400 rpm. When the crank has turned through 30° from the inner dead centre, the difference of pressure between cover and piston rod is 0.4 N/mm². If the mass of the reciprocating parts is 100 kg and cylinder bore is 0.4 meters, then calculate;
- Inertia force
 - Force on piston
 - Piston effort
 - Thrust on the sides of the cylinder walls
 - Thrust in the connecting rod
 - Crank effort

15. a 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.

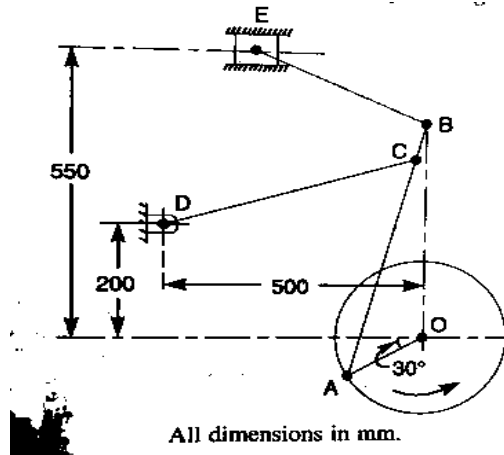
Or

- b A vibrating system consists of a mass of 200 kg, a spring of stiffness 80 N/mm and a damper with damping coefficient of 800 N/m/s. Determine the frequency of vibration of the system.

PART - C (Marks 1*15 = 15)

<i>Q.No</i>	<i>Questions</i>	<i>BLT</i>	<i>CO</i>	<i>Marks</i>
16.	a	AN	1	15

The mechanism of a radial valve gear shown in figure. The crank OA turns uniformly at 150 r.p.m and is pinned at A to rod AB. The point C in the rod is guided in the circular path with D as centre and DC as radius. The dimensions of various links are: OA = 150 mm; AB = 550 mm; AC = 450 mm; DC = 500 mm; BE = 350 mm. Determine velocity and acceleration of the ram E for the given position of the mechanism.



Or

b	A shaft of 100 mm diameter and 1 metre long has one of its end fixed and the other end carries a disc of mass 500 kg at a radius of gyration of 450 mm. The modulus of rigidity for the shaft material is 80 GN/m ² . Determine the frequency of torsional vibrations.	AN	5	15
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