BIRLA INSTITUTE OF TECHNOLOGY, MESRA, RANCHI
(MID SEMESTER EXAMINATION SP2023)

CLASS: B.TECH **SEMESTER : IV**
BRANCH: MECHANICAL/PRODUCTION **SESSION : SP2023**

SUBJECT: ME207 KINEMATICS AND DYNAMICS OF MACHINES

TIME: 02 Hours **FULL MARKS: 25**

INSTRUCTIONS:
1. The question paper contains 5 questions each of 5 marks and total 25 marks.
2. Attempt all questions.
3. The missing data, if any, may be assumed suitably.
***4*. Tables/Data handbook/Graph paper etc., if applicable, will be supplied to the candidates**

			CO	BL
Q.1(a)	Explain the terms: 1. Lower pair, 2. Higher pair, 3. Kinematic chain, and 4. Inversion of mechanism.	[2]	1	2
Q.1(b)	Identify all the inversion mechanisms of the kinematic chain given in Figure 1 with proper explanations.	[3]	1	1,2

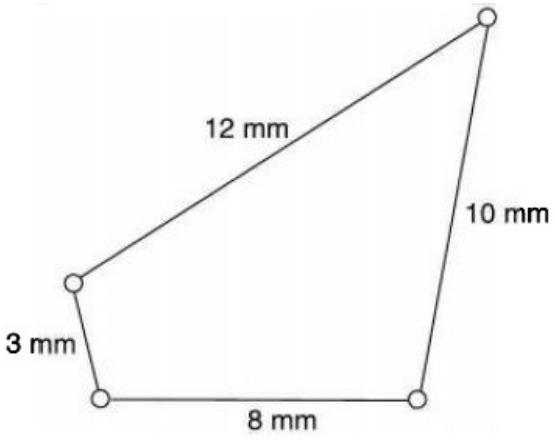

Figure 1

Q.2(a)	Describe and explain angular velocity ratio theorem of a mechanism.	[2]	1,2	2
Q.2(b)	Explain Kennedy's theorem used to locate the I-centers of a mechanism. Also, locate the I-Centers of a four-bar mechanism using Kennedy's theorem.	[2+1]	1,2	2,3

Q.3(a)	Explain the conditions of static equilibrium of a body.	[2]	1,2	2
Q.3(b)	At any instant, the configuration of a slider-crank mechanism is shown in Figure 2. Derive the expressions of displacement, velocity, and acceleration of the piston. Assume that the connecting rod is very large as compared to the crank.	[3]	1,2	6

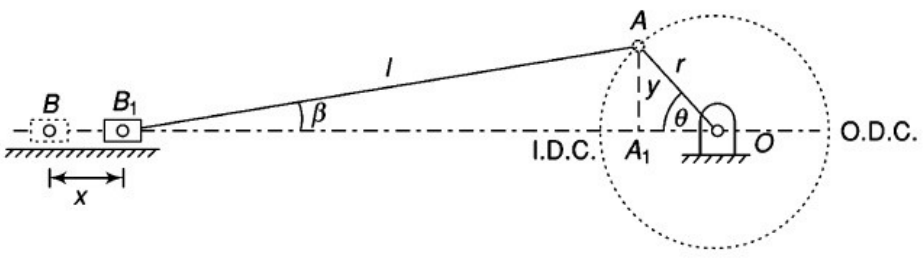

Figure 2

PTO

Q.4(a)	Explain: piston effort and crank effort of an engine.	[2]	1,2	2
Q.4(b)	In a vertical double-acting steam engine, the connecting rod is 4.5 times the crank. The weight of the reciprocating parts is 120 kg and the stroke of the piston is 440 mm. The engine runs at 250 rpm. If the net load on the piston due to steam pressure is 25 kN when the crank has turned through an angle of 120^{o} from the top dead centre, determine (i) thrust in the connecting rod, (ii) tangential force on the crank pin, and (iii) thrust on the bearings.	[3]	1,2	5
Q.5(a)	Explain: coefficient of fluctuation of energy and coefficient of fluctuation of speed of the flywheel	[2]	4	
Q.5(b)	A flywheel absorbs 24 kJ of energy on increasing its speed of 210 rpm to 214 rpm. Determine its kinetic energy at 250 rpm.	[3]	4	

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