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UG Mechanical 2024-25 PYQP

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2025-05-05

KINEMATICS OF MACHINES

Department of Mechanical Engineering – SEAS

SRM UNIVERSITY A.P

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SRM UNIVERSITY – AP, ANDHRA PRADESH

End Term Examination, May 2025

[Question Paper ID: 009036]

Subject : KINEMATICS OF MACHINES

Title

Batch : 2023

Degree : B.Tech.

Branch : ME

Subject : MCE 208

Code

Max Marks : 60

Duration : 3 hours

QP Set : ---

Section-A (10 × 6 Marks = 60 Marks)

Answer **any 10** Questions

Marks BL CO

- | | | | | |
|---|----------|----------|----------|----------|
| 1. Describe double slider crank chain and its inversions. | 6 | 6 | 2 | 1 |
| 2. Define the followings.
(a) Spherical and Rolling Pair
(b) Degree of Freedom
(c) Sliding and Turning Pair
(d) Lower and Higher Pair
(e) Kinematic Pair | 6 | 6 | 1 | 1 |
| 3. A horizontal gas engine running at 210 rpm has a bore of 220 mm and a stroke of 440 mm. The connecting rod is 924 mm long and reciprocating parts weight 20 kg. When the crank has turned through an angle of 30° from the inner dead centre, the gas pressures on the cover and crank sides are 500 kN/m^2 and 60 kN/m^2 respectively. Diameter of piston rod is 40 mm. Determine the followings:
(a) Turning moment on the crank shaft
(b) Thrust on the bearings
(c) Acceleration of the flywheel which has a mass of 8 kg and a radius of gyration of 600 mm while the power of the engine is 22 kW. | 6 | 6 | 5 | 2 |
| 4. Define kinematic pairs and categorize them based on contact type, relative motion, and mechanical constraints. | 6 | 6 | 2 | 2 |
| 5. Explain the followings:
(a) Static and Dynamic Balancing
(b) Hammer Blow
(c) Variation of Tractive Force
(d) Swaying Couple | 6 | 6 | 4 | 3 |
| 6. Derive an expression for velocity and acceleration of the piston of a reciprocating engine. | 6 | 6 | 4 | 3 |
| 7. Describe the classifications of cams and followers. | 6 | 6 | 1 | 4 |
| 8. The following data relate to a single cylinder reciprocating engine.
Mass of reciprocating parts = 40 kg
Mass of revolving parts = 30 kg at crank radius
Speed = 150 rpm
Stroke = 350 mm
If 60% of the reciprocating parts and all the revolving parts are to be balanced. Determine
(a) Balance mass required at a radius of 320 mm
(b) Unbalanced force when the crank has turned 45° from the top dead centre | 6 | 6 | 5 | 4 |

9.

Three masses of 8 kg, 12 kg, and 15 kg attached at radial distances of 80 mm, 100 mm, and 60 mm respectively to a disc on a shaft are in complete balance. Determine the angular positions of masses of 12 kg and 15 kg relative to the 8 kg mass.	6	6	5	3
10. Two involute gears in a mesh have a module of 8 mm and a pressure angle is 20° . The larger gear has 57 while the pinion has 23 teeth. If the addenda on pinion and gear wheels are equal to one module, find the (i) Contact Ratio (the numbers of pairs of teeth in contact) (ii) Angle of action of the pinion and the gear wheel (iii) Ratio of sliding to rolling velocity at the (a) Beginning of contact (b) Pitch point (c) End of contact	6	6	4	4
11. Derive the expression for path of contact for two gear wheels in contact.	6	6	1	3
12. A circular disc mounted on a shaft carries three attached masses of 4 kg, 3 kg and 2.5 kg at radial distances of 75 mm, 85 mm and 50 mm and at the angular positions of 45° , 135° and 240° respectively. The angular positions are measured counter clockwise from the reference line along the x-axis. Determine the amount of counter mass at a radial distance of 75 mm required for the static balance.	6	6	5	4

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