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***B.Tech. Degree IV Semester Supplementary Examination in
Marine Engineering June 2023***

**MRE 1401 MECHANICS OF MACHINERY
(2013 Scheme)**

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Define and explain the terms: (10)
- Mechanism and Machine
 - Link and Kinematic pair
- (b) What do you mean by inversion of a mechanism? Explain with sketches all the inversions of slider crank mechanism. (10)

OR

- II. (a) Define the terms: (8)
- Velocity
 - Acceleration
 - Tangential acceleration
 - Centripetal acceleration
- (b) A link OR rotating about point O at a particular instant When $\theta = 90^\circ$ with x-axis, the angular velocity of the link is 2 rad/s counter-clock wise and angular acceleration is 5 rad/s² counter-clock wise. A slider P is sliding along the rod radially outward and at that instant, the distance of slider from point 'o' is 2 m (ie distance OP = 2m). The corresponding point on the rod is Q, the velocity and acceleration of the point P at that instant with respect to point Q are 3 m/s and 4 m/s² both radially outwards. Find the acceleration of point 'P' relative to point O. Also find: (12)
- The acceleration of Q relative to O
 - Acceleration of P relative to Q

- III. (a) Explain Pantograph with neat sketch. (10)
- (b) Write notes on different types of cams and followers. (10)

OR

- IV. Draw the profile of a cam operating a knife-edge follower when the axis of the follower pass through the axis of cam shaft from the following data: (20)
- Follower to move outwards through 40 mm during 60° of cam rotation.
 - Follower to dwell for the next 45°.
 - Follower to return to its original position during next 90°.
 - Follower to dwell for the rest of the cam rotation.

The displacement of the follower takes place with simple harmonic motion during both the outward and return stroke. The least radius of cam is 50 mm. If the cam rotates at 300 rpm, determine the maximum velocity and acceleration of the follower during outward and return stroke.

- V. Calculate the change in vertical height of a watt governor when its speed. (20)
- increases from 50 rpm to 51 rpm.
 - increases from 200 rpm to 201 rpm.

OR

- VI. Calculate the minimum speed, maximum speed and range of the speed of a porter governor, which has equal arms each 200 mm long and pivoted on the axis of rotation. The mass of each ball is 4 kg and the central mass on the sleeve is 20 kg. The radius of rotation of the ball is 100 mm when the governor begins to lift and 130 mm when the governor is at maximum speed. (20)

- VII. (a) Differentiate between involute and cycloid gear profiles. (10)
(b) What are the advantages of worm gears. (10)

OR

- VIII (a) Explain simple and compound gear train with sketch. (10)
(b) A spur gear has a module of 2 mm and its pitch line velocity is 0.6283 m/s. If the number of teeth of this spur gear is 30. Find the speed of the gear. Also determine its circular pitch. (10)

- IX. (a) What are the advantages of V-belt over flat belt . (8)
(b) With neat sketch, explain the working of a single plate clutch. (12)

OR

- X. (a) Describe the working of internal expanding shoe brake with neat sketch. (12)
(b) Write a note on rope brake dynamometer. (8)
