B.Tech. Degree IV Semester Regular Examination in Marine Engineering April 2021

19-208-0401 MECHANICS OF MACHINERY
(2019 Scheme)

Time: 3 Hours   Maximum Marks: 60

(5×15=75)

I.   With neat sketches explain about the inversions of a slider-crank (15)
mechanism and their applications.

OR

II.   A toggle mechanism is shown in the figure along with dimensions of the (15)
links in mm. Find the velocities of the points B and C and the angular
velocities of links AB, BQ and BC. The rank rotates at 50 RPM in the
clockwise direction.

(mm)
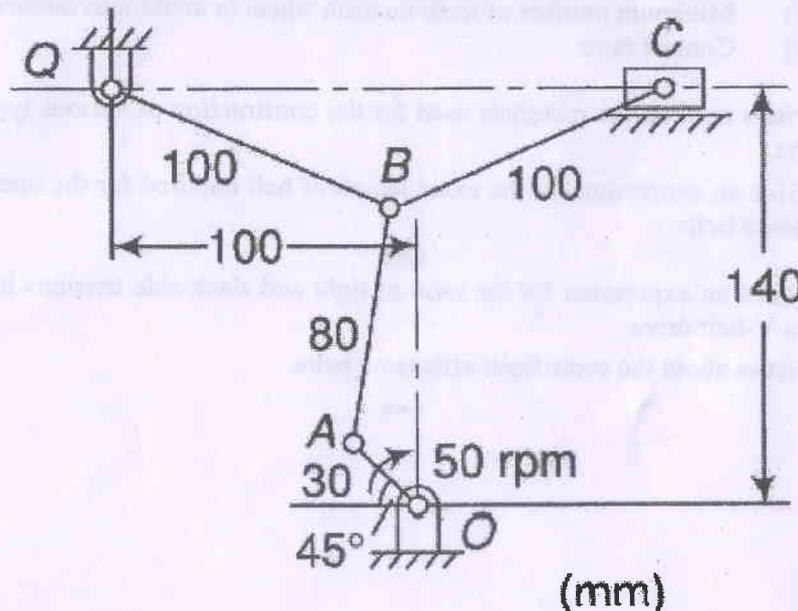
III.   The following data relate to a cam profile in which the follower moves (15)
with uniform acceleration and deceleration during the ascent and descent.

Minimum radius of cam = 25 mm, Roller diameter = 7.5 mm,
Lift = 28 mm, Offset of follower axis = 12 mm towards right, Angle of
ascent = 60°, Angle of descent = 90°, Angle of swell between ascent and
descent = 45°, Speed of the cam = 200 RPM. Draw the profile of the cam
and determine the maximum velocity and the uniform acceleration of the
follower during the outstroke and the return stroke.

OR

IV.   A flat-faced mushroom follower is operated by a uniformly rotating cam. (15)
The follower is raised through a distance of 25 mm in 120° rotation of the
cam, remains at rest for the next 30° and is lowered during further 120°
rotation of the cam, The raising of the follower takes place with cycloidal
motion and the lowering with uniform acceleration and deceleration.
However, the uniform acceleration is 2/3 of the uniform deceleration. The
least radius of the cam is 25 mm which rotates at 300 RPM. Draw the cam
profile and determine the values of maximum velocity and maximum
acceleration during rising, and maximum velocity and uniform acceleration
and deceleration during lowering of the follower.

V.		How does a Porter governor differ from that of a Watt governor?	(15)

OR

VI.	(a)	Sketch a Hartnell governor. Describe its function and deduce a relation to find the stiffness of the spring.	(10)
	(b)	In a Hartnell governor, the extreme radii of rotation of the balls are 40 mm and 60 mm, and the corresponding speeds are 210 RPM and 230 RPM. The mass of each ball is 3 kg. The lengths of the ball and the sleeve arms are equal. Determine the initial compression and the constant of the spring	(5)

VII.		With neat sketches explain the terminologies of a spur gear.	(15)

OR

VIII.	(a)	Derive an expression for the minimum number of teeth to avoid interference.	(10)
	(b)	Two 20° involute spur gears mesh externally and give a velocity ratio of 3. The module is 3 mm and the addendum is equal to 1.1 module. If the pinion rotates at 120 RPM, determine the	(5)
		(i) Minimum number of teeth on each wheel to avoid interference	
		(ii) Contact ratio	

IX.	(a)	Write a note on the materials used for the construction of various types of belts.	(5)
	(b)	Derive an expression for the exact length of belt required for the open and crossed belts.	(10)

OR

X.	(a)	Deduce an expression for the ratio of tight and slack side tensions in case of a V-belt drive.	(10)
	(b)	Discuss about the centrifugal effects on belts.	(5)

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