

Total No. of Printed Pages:4

SUBJECT CODE NO:- H-168
FACULTY OF SCIENCE AND TECHNOLOGY
S.E. (Mech/Prod) (Sem-II)
Theory of Machines –I
[Revised]

[Time: Four Hours]

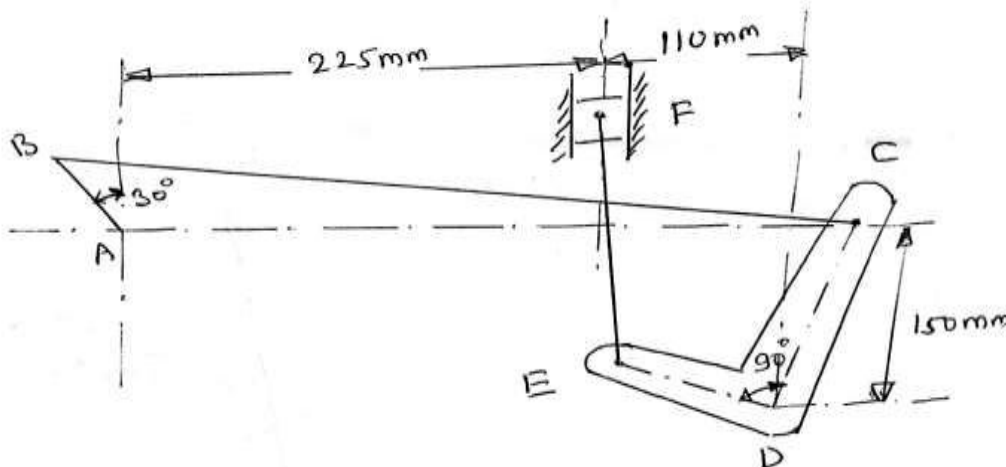
[Max.Marks:80]

Please check whether you have got the right question paper.

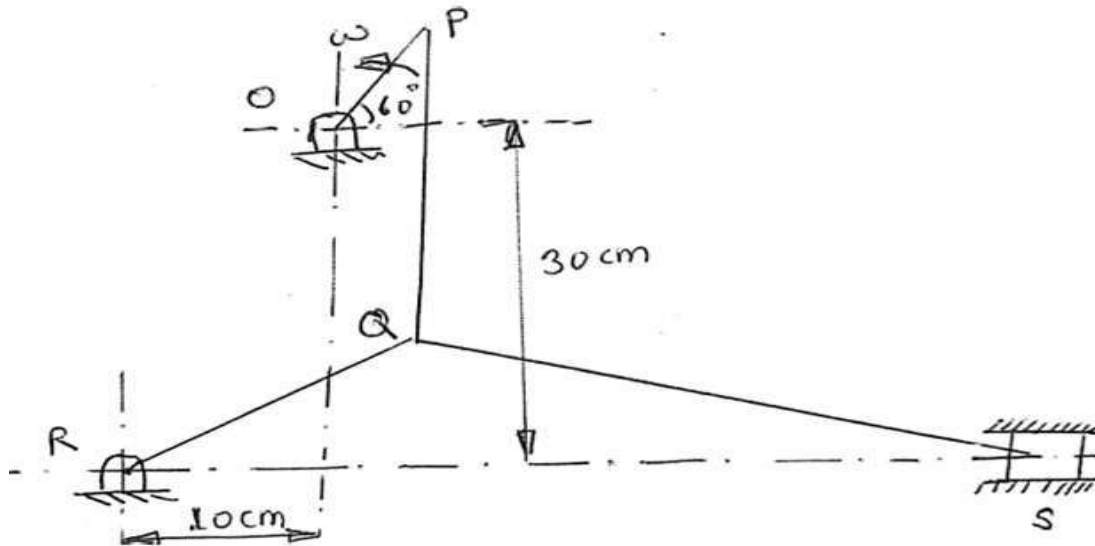
- N.B
1. Q.no.1 and Q.no.6 are compulsory.
 2. Attempt any two questions out of remaining from each section.
 3. Figures to the right indicate full marks
 4. Draw neat sketches wherever necessary
 5. Assume suitable data wherever necessary

Section -A

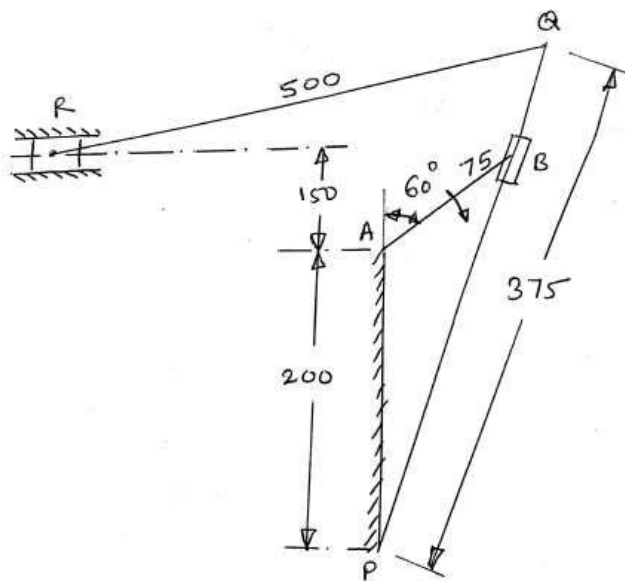
- Q.1 Attempt any five 10
- A) Define kinematics and dynamics
 - B) What is degree of freedom of mechanism
 - C) Classify kinematic pair in detail
 - D) What is inversion of mechanism
 - E) State inversions of double slider crank chain with example.
 - F) Draw neat sketch of any two inversion of single slider crank chain.
 - G) What is importance of velocity and acceleration analysis
 - H) Define radial component of acceleration
 - I) When to consider the coriolis component of acceleration in analysis
 - J) State properties & instantaneous center of rotation.
- Q.2 The dimensions of various links in a mechanism as shown in figure 1, are as follows 15
 AB=60mm, BC= 400mm, CD= 150mm DE= 115mm and EF=225mm
 Find the velocity of the slider F when the crank AB rotates uniformly in clockwise direction at a speed of 60 rpm.



- Q.3 The mechanism in which the length of various links are as follows $OP=15\text{cm}$, $PQ=30\text{cm}$, $QR=22.5\text{cm}$ and $QS=50\text{cm}$. 'S' is a slider which is constrained to move in a horizontal direction for the given configuration, find the velocity of slider S and angular velocity of links QR and QS when the crank OP is rotating uniformly with a speed of 200 rpm in counter clockwise direction by instantaneous centre method (refer figure 2) 15



- Q.4 The driving crank AB of the quick – return mechanism as shown in figure 3 revolves at a uniform speed of 200 rpm. Find the velocity and acceleration of the tool- box R, in the position as shown when the crank makes an angle of 60° with the vertical line of center PA what is the acceleration of sliding of the block at B along the slotted lever PQ 15



- Q.5 a) Derive an expression for acceleration of engine mechanism. 08
 b) Explain with neat sketch crank and slotted lever mechanism. 07

Section – B

- Q.6 Attempt any five 10
- State material for brake lining
 - Compare band and block brake
 - What is self energizing brakes
 - Define pressure angle of cam
 - Define static balancing
 - State condition of Dynamic balancing
 - State procedure of balancing of masses rotating in different plane
 - Define swaying couple
 - Compare primary and secondary unbalance force
 - What is variation of tractive force

- Q.7 A cam operate a flat faced follower which moves with cycloidal motion during ascent and descent The minimum radius of cam = 30mm 15
 Lift of follower = 40mm
 Angle of ascent = 120°
 Angle of dwell = 60°
 Angle of descent = 90 °
 Speed of cam = 320 rpm

Draw the cam profile and find the maximum velocity and acceleration of the follower during ascent and descent

- Q.8 A band and block brake, having 12 blocks each of which subtends an angle of 13° at the centre is applied to the drum of 1m effective diameter. The drum and flywheel mounted on the same shaft has a mass of 2000kg and a combined radius of gyration of 500 mm. The two ends of the band are attached to pins on opposite side of the brake lever at a distance of 30mm and 120mm from the fulcrum. If a force of 200 N is applied at a distance of 750 mm from the fulcrum. Find 15
- Maximum braking torque
 - Angular retardation of the drum
 - Time taken by the system to come to rest from the rated speed of 360 rpm. $\mu = 0.3$
- Q.9 a) Four masses P,Q,R and S revolves at equal radii and are equally spaced along a shaft. The mass Q is 7 kg and the radii of R and S make angles of 90° and 240° respectively with the radius Q find the magnitude of the masses P,R and S and the angular position of P so that the system may be completely balanced.
- Q.10 A four crank engine has the two outer cranks set at 120° to each other and their reciprocating masses are each 400 kg. The distance between the planes of rotation of adjacent cranks are 450mm , 750mm and 700mm.If the engine is to be in complete primary balance, find the reciprocating mass and the relative angular position for each of the inner cranks. 15
If the length of each crank is 300mm, the length of each connecting rod is 1.2m and the speed of rotation is 240 rpm what is maximum secondary unbalanced force ?