

PARUL UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
B.Tech. Winter 2022-23 Examination

Semester: 3

Subject Code: 203101217/203101209

Subject Name: Analysis of Mechanism and Machine Elements

Date: 11-10-2022

Time: 02:00 PM TO 04:30 PM

Total Marks: 60

Instructions:

1. All questions are compulsory.
2. Figures to the right indicate full marks.
3. Make suitable assumptions wherever necessary.
4. Start new question on new page.

Q.1 Objective Type Questions - (All are compulsory) (Each of one mark) (15)

1. Provide any example of completely constrained motion.
2. According to Grashof's law for four bar mechanism, _____ holds true where shortest (S) and longest link (L) lengths and remaining two link lengths are P and Q.
3. The total number of I-centres (N) for a mechanism with n number of links is given by $N =$ _____.
4. The _____ of rivet is the distance between two consecutive rivets measured parallel to the direction of the force in the structural member.
5. Tangential component of acceleration acts _____ to the link.
6. Machine is a collection of _____ arranged to transmit forces and do work.
7. The algebraic sum of the angular velocities of the two links which are connected by pin joints, multiplied by the radius of the pin is called as _____.
8. Join between two plates in the same plane is known as _____ joint.
9. Motions which are measured with respect to other moving bodies are known as _____ motion of a body with respect to the moving body.
10. The parallel fillet welded joint is designed for _____ strength.
11. For a Whitworth quick return motion mechanism $\beta = 110^\circ$. Find the ratio of time of cutting stroke to time of return stroke.
 - a) 0.42
 - b) 0.44
 - c) 2.27
 - d) 2.37
12. The lower pairs are _____ pairs.
 - a) self-closed
 - b) forced-closed
 - c) friction-closed
 - d) none
13. Represent a velocity of link B relative to link A.
14. State the type of inversion used in rotary internal combustion engine.
15. The locus of the instantaneous centre in space during a definite motion of the body is called as _____.

Q.2 Answer the following questions. (Attempt any three) (15)

- A) Differentiate between closed and unclosed pair.
- B) Describe the D'Alembert's principle.
- C) State principle of virtual work
- D) State the stresses developed in shaft.

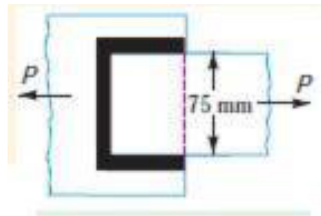
Q.3 A) Explain in details the types of welded joints and its advantages over riveted joints. (07)

- B) A propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft, having an inside diameter 0.6 times of outside diameter. It is made of plain carbon steel and the permissible shear stress is 84 N/mm². Calculate the inside and outside diameters of the shaft. (08)

OR

- B) A plate 75 mm wide and 12.5 mm thick is joined with another plate by a single transverse weld (08) and a double parallel fillet weld as shown in Figure. The maximum tensile and shear stresses are

70 MPa and 56 MPa respectively. Find the length of each parallel fillet weld, if the joint is subjected to static loading.

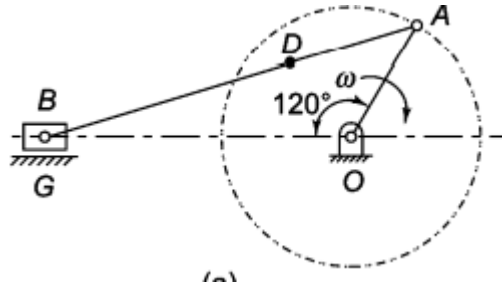


Q.4 A) Explain in detail the types of riveted joints and design criterions. (07)

OR

A) Explain in detail the shaft design when only subjected to bending moment. (07)

B) (08)



Above fig. shows configuration of an engine mechanism. The dimensions are following:
 Crank $OA=200\text{mm}$, connecting rod $AB=600\text{mm}$, distance of centre of mass from crank end, $AD = 200\text{mm}$. At the instant, the crank has an angular velocity of 50 rad/s clockwise and an angular acceleration of 800 rad/s^2 . Calculate the

- 1) Velocity of D and angular velocity of AB
- 2) Acceleration of D and angular acceleration of AB