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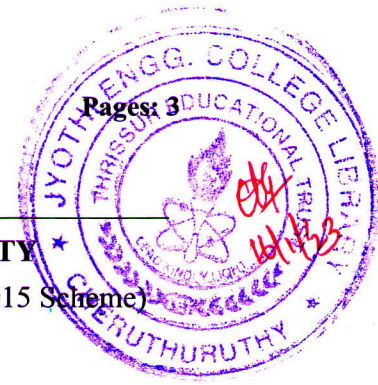
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Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree (S, FE) Examination January 2023 (2015 Scheme)



Course Code: ME301

Course Name: MECHANICS OF MACHINERY

Max. Marks: 100

Duration: 3 Hours

PART A

Answer any three full questions, each carries 10marks.

Marks

- | | | | |
|---|---|--|----|
| 1 | a | What is the difference between higher pair and lower pair? Mention an example for each. | 4 |
| | b | Sketch the Peaucellier straight line motion mechanism. Prove that the tracing point describes a straight-line path. | 6 |
| 2 | a | What is meant by mobility of a mechanism? Also, state Grashof's law. | 4 |
| | b | What is mechanical advantage of mechanism? How it is related to velocity ratio? | 6 |
| 3 | | The length of the crank OP, in a crank and slotted link quick return mechanism is 120 mm. The dimensions of the slotted link AR and ram RS are 450 mm and 170 mm respectively. The distance between the fixed centres O and A is 300 mm. The crank is making an angle of 120° with the fixed centre at an instant during its rotation. The uniform speed of the crank is 70 rpm clockwise. The line of stroke of the ram is perpendicular to OA and is 500 mm above A. Determine the velocity and acceleration of the slider. | 10 |
| 4 | | Construct the displacement curve for a cam and follower subjected to cycloidal motion. Express the maximum velocity and acceleration of the follower analytically for the said motion. | 10 |

PART B

Answer any three full questions, each carries 10marks.

- | | | | |
|---|--|--|----|
| 5 | | A cam, with a minimum radius of 25 mm, rotating clockwise at a uniform speed is to be designed to give a roller follower, at the end of a valve rod, motion described below: | 10 |
| | | 1. To raise the valve through 50 mm during 120° rotation of the cam; | |

2. To keep the valve fully raised through next 30° ;
3. To lower the valve during next 60° ; and
4. To keep the valve closed during rest of the revolution i.e. 150° ;

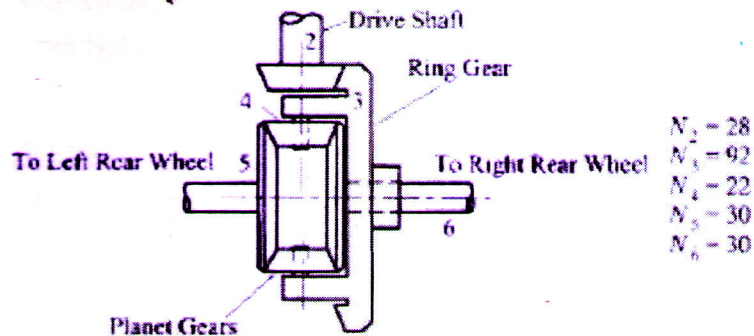
The diameter of the roller is 20 mm and the diameter of the cam shaft is 25 mm. Draw the profile of the cam when the line of stroke of the valve rod passes through the axis of the cam shaft. The displacement of the valve, while being raised and lowered, is to take place with simple harmonic motion.

- 6 A symmetrical circular cam operates a flat faced follower with a lift of 50 mm. The minimum radius of the cam is 60 mm and the nose radius is 15 mm. The angle of lift is 100° . The cam is rotating with a speed of 240 rpm. Synthesize the cam and compute the acceleration of the follower. 10
- a) When it contacts with the flank of the cam,
 - b) When it rests on the nose of the cam.
- 7 A 20° involute pinion with 20 teeth drives a gear having 60 teeth. Module is 8 mm and addendum of each gear is 10 mm. 10
1. State whether interference occurs or not. Give reasons.
 2. Find the length of path of approach and arc of approach if pinion is the driver.
- 8 a Draw a gear tooth profile and mark the following: 4
1. Addendum, 2. Dedendum, 3. Clearance, 4. Total depth, 5. Working depth, 6. Tooth thickness, 7. Tooth space and 8. Backlash.
- b Explain the cause of interference in gears using a neat figure showing addendum circles and path of contact. Explain how to avoid interference. 6

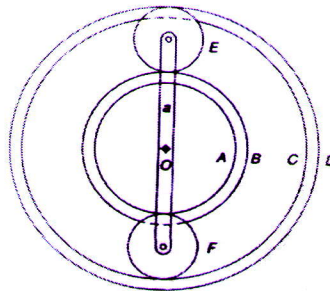
PART C

Answer any four full questions, each carries 10marks.

- 9 The differential system for a rear wheel drive vehicle is given in the figure. The drive shaft is rotating at a speed of 900 rpm. Calculate the speed of the vehicle without wheels slipping. The outside diameter of the wheels is 60 mm. 10



- 10 In the epicyclic gear train show the compound wheels A and B as well as internal wheels C and D rotate independently about the axis O. The wheels E and F rotate on the pins fixed to the arm a. Number of teeth on wheels A, B, E and F are 52, 56, 36 and 36 respectively. Determine the speed of C if the wheel D fixed and arm a rotates at 200 rpm clockwise. 10



- 11 A four bar mechanism is to be designed for two angular displacements of the input. Illustrate the graphical procedure to solve this function generation problem. 10
- 12 a The value of a function varies from 0 to 9. Find the Chebychev spacing for six precision points. 6
- b What is path generation and motion generation in kinematic synthesis? 4
- 13 Calculate the dimensions of a four-link mechanism if the motions of the input and the output links are governed by a function $y = x^{1.5}$ and x varies from 1 to 4. Assume input angle to vary from 30° to 120° and output angle from 60° to 130° . Take length of fixed link as 30mm. Use Chebychev spacing of accuracy points. 10
- 14 Derive Freudenstein's equations for kinematic synthesis. 10
