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Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree S4 (R) (FT/WP) Examinations April 2026 (2024 Scheme)

Course Code: PBMET404
Course Name: Mechanics of Machinery

Max. Marks: 40 Duration: 2 hours 30 minutes

PART A

(Answer all questions. Each question carries 3 marks) Marks

1 What is meant by the degree of freedom? Why does a screw pair have only one degree of freedom? (2)

2 What is meant by kinematic inversion? Explain how a double rocker mechanism is obtained. (2)

3 State and explain Aronhold – Kennedy theorem. (2)

4 Explain all the possible cases of direction of Coriolis component of acceleration with neat sketches. (2)

5 Define motion generation, path generation and function generation. (2)

6 Explain different types of followers with neat sketches. (2)

7 Explain the gear terminologies a) Circular pitch, b) Diametral pitch, c) Module, and d) Addendum. (2)

8 What is reverted gear train? What are the uses of reverted gear train? (2)

PART B

(Answer any one full question from each module, each question carries 6 marks)

Module -1

9 a) Explain elliptical trammel with a neat sketch. Prove that any point on the connecting rod traces an ellipse. (3)

b) The ratio of width of the front axle and that of the wheel base of a steering gear mechanism is 0.5. At the instant the front inner wheel is turned by 18°. What should be the angle turned by the outer front wheel for perfect steering? (3)

10 a) Find out degrees of freedom of mechanism shown in Figure 1 (3)

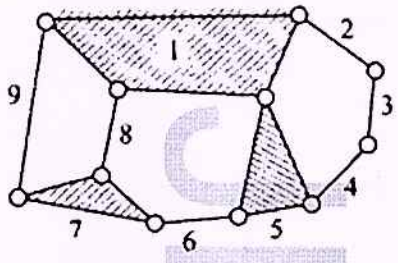

Figure 1

b) Explain Watt's approximate straight-line mechanism with a neat diagram. (3)

Module -2

11 a) In Figure 2 the angular velocity of the crank OA is 600 rpm. Determine the linear velocity of the slider 6 and the angular velocity of the link 5, when the crank is inclined at an angle of 75^0 to the vertical.

(OA=28 mm, AB = 44 mm, BC = 49 mm, OC = 65 mm, BD = 46 mm, $\angle AOC = 75^0$) (6)

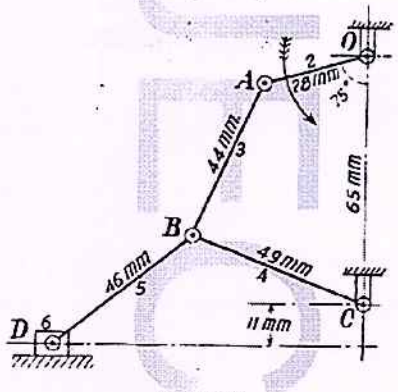

Figure 2

12 a) In the slider crank mechanism shown in Figure 3, the crank OA rotates with uniform velocity of 600 rpm. Determine the linear acceleration of slider Band also point Q located at a distance of 5 cm on the connecting rod extended.

(OA=7.5 cm, AB = 30 cm, AQ = 5 cm, $\angle BOA = 45^0$) (6)

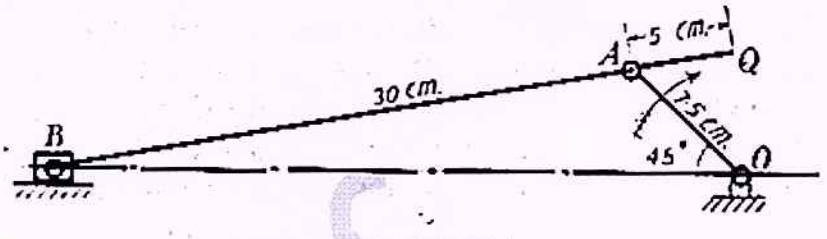

Figure 3

Module -3

13 A 4-bar mechanism is required such that the input and output are as given below. Synthesize the 4-bar mechanism.

Input crank angle	30°	50°	80°
Output follower angle	0°	30°	60°

(6)

14 A cam is to give the following motion to the knife-edged follower.

(i) To raise the follower through 30 mm with uniform acceleration and deceleration during 120° rotation of the cam
(ii) Dwell for the next 30° of the cam rotation
(iii) To lower the follower with simple harmonic motion during the next 90° rotation of the cam
(iv) Dwell for the rest of the cam rotation

The cam has minimum radius of 30 mm and rotates counter-clockwise at a uniform speed of 800 rpm. Draw the profile of the cam if the line of stroke of the follower passes through the axis of the cam shaft. (6)

Module -4

15 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 the 120 rpm, determine;

(i) Minimum no of teeth on each wheel to avoid interference
(ii) Contact ratio (6)

16 In a reverted epicyclic gear train (Figure 4), the arm A carries two gears B and C and a compound gear D - E. The gear B meshes with gear E and the gear C meshes with gear D. The number of teeth on gears B, C and D are 75, 30 and 90 respectively. Find the speed and direction of gear C when gear B is fixed and the arm A makes 100 rpm clockwise. (6)

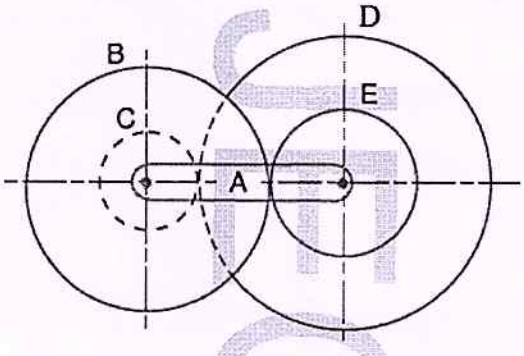

Figure 4

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