17637

BRAINWARE UNIVERSITY

Term End Examination 2025-2026
Programme – Dip.ME-2024
Course Name – Theory of Machines and Mechanisms
Course Code - DME30106
(Semester III)

Full Marks : 60 **Time : 2:30 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question) 1 x 15=15

1. *Choose the correct alternative from the following :*

(i) Identify the number of links is associated with quick return mechanisms.

a) One link b) Two links
c) Three links d) Four links

(ii) Identify the type of belt drive commonly used for long-distance power transmission.

a) Open belt drive b) Cross belt drive
c) V-belt drive d) Flat belt drive

(iii) Identify the type of gear used to connect two parallel shafts.

a) Bevel gear b) Spur gear
c) Worm gear d) Rack and pinion

(iv) Select the most suitable gear for transmitting motion between non-intersecting and perpendicular shafts.

a) Bevel gear b) Spur gear
c) Worm gear d) Helical gear

(v) Identify the primary function of a flywheel in an engine.

a) To store energy and smooth out fluctuations in speed b) To increase fuel efficiency
c) To reduce engine temperature d) none of these.

(vi) Select the type of energy stored in a flywheel.

a) Kinetic energy b) Potential energy
c) Chemical energy d) none of these.

(vii) Identify the primary function of a governor in an engine.

a) To store rotational energy b) To regulate engine speed under varying loads
c) To convert reciprocating motion into rotary motion d) none of these.

(viii) Select the correct definition of a kinematic chain.

a) A system of rigid links
b) A single rotating link
c) A flexible mechanism
d) A type of engine

(ix) Calculate the velocity ratio of a simple gear train with a driver gear of 20 teeth and a driven gear of 40 teeth.

a) 2
b) 0.5
c) 1
d) 1.5

(x) Identify the type of gear used for non-parallel and non-intersecting shafts.

a) Spur gear
b) Helical gear
c) Bevel gear
d) Worm gear

(xi) Calculate the gear ratio for a compound gear train with gears of 20, 40, and 60 teeth.

a) 0.5
b) 1
c) 1.5
d) 2

(xii) Identify the type of gear used for high-speed applications.

a) Spur gear
b) Helical gear
c) Bevel gear
d) Worm gear

(xiii) Calculate the center distance for two gears with 20 and 40 teeth and a module of 2.

a) 30 mm
b) 40 mm
c) 50 mm
d) 60 mm

(xiv) Select the type of gear train used for large speed reductions.

a) Simple gear train
b) Epicyclic gear train
c) Reverted gear train
d) Differential gear train

(xv) Recall the minimum number of links needed to form a closed kinematic chain.

a) 2
b) 3
c) 4
d) 6

Group-B

(Short Answer Type Questions) 3 x 5=15

2. Describes rigid body and resistant body with example. (3)
3. Define the following terms: a) kinematic link b) kinematic pair and c) kinematic chain (3)
4. Discuss advantage and disadvantage of rolling contact bearing. (3)
5. The difference between tensions on tight and slack sides of a belt drive is 3000 N. If the belt speed is 15m/sec, calculate the transmitted power (in KW). (3)
6. A belt drive is used to transmit motion between two pulleys. The driver pulley has a diameter of 400 mm and rotates at 1200 RPM, while the driven pulley has a diameter of 800 mm. Assuming there is no slip, determine the speed of the driven pulley in RPM. (3)

OR

A radial cam lifts a roller follower (diameter = 20 mm) in uniform acceleration and deceleration over 150° of rotation. If the camshaft rotates at 400 RPM and the maximum lift is 50 mm, find the velocity and acceleration at the midpoint of the lift. (3)

Group-C

(Long Answer Type Questions) 5 x 6=30

7. Explain Crank and slotted lever quick-return motion mechanism with neat sketch. (5)
8. Draw a radial cam profile with reciprocating roller follower and showing its nomenclature. (5)
9. Explain the role of flywheel in maintaining speed stability in IC engines. (5)
10. Evaluate the suitability of disc brakes over drum brakes in high-speed vehicles. (5)
11. Describe the construction and operation of a single plate clutch. (5)

12. A governor has a sleeve mass of 5 kg and the radius of rotation varies from 250 mm to 300 mm when the speed changes from 250 RPM to 270 RPM. Determine the effort and power of the governor. (5)

OR

Four masses 150, 250, 200 and 300 kg are rotating in the same plane at radii of 0.25, 0.2, 0.3 and 0.35 m, respectively. Their angular location is 40°, 120° and 250° from mass 150 kg, respectively, measured in counter-clockwise direction. Evaluate the position and magnitude of the balance mass required, if its radius of rotation is 0.25 m (By using Analytical Method). (5)

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