# BRAINWARE UNIVERSITY

## Term End Examination 2023
### Programme – Dip.ME-2019/Dip.ME-2021
### Course Name – Theory of Machines & Mechanisms
### Course Code - DME402
### ( Semester IV )

**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) In a reciprocating steam engine, Identifying the following forms a kinematic link

    a) cylinder and piston
    b) piston rod and connecting rod
    c) crank shaft and flywheel
    d) flywheel and engine frame

(ii) The motion of a piston in the cylinder of a steam engine is an example of

    a) completely constrained motion
    b) incompletely constrained motion
    c) successfully constrained motion
    d) none of these

(iii) When the elements of the pair are kept in contact by the action of external forces, the pair is said to be

    a) lower pair
    b) higher pair
    c) self-closed pair
    d) force closed pair

(iv) Identify, a turning pair from the followings

    a) Piston and cylinder of a reciprocating steam engine
    b) Shaft with collars at both ends fitted in a circular hole
    c) Lead screw of a lathe with nut
    d) Ball and socket joint

(v) According to Aronhold Kennedy's theorem, if three bodies move relatively to each other, their instantaneous centres will lie on a _____

    a) straight line
    b) parabolic curve
    c) ellipse
    d) none of these

(vi) In a mechanism, the fixed instantaneous centres are those centres which

    a) remain in the same place for all configurations of the mechanism
    b) vary with the configuration of the mechanism
    c) moves as the mechanism moves, but joints are of permanent nature
    d) none of the above

(vii) The instantaneous centres which vary with the configuration of the mechanism, are classified as

    a) permanent instantaneous centres
    b) fixed instantaneous centres
    c) neither fixed nor permanent instantaneous centres
    d) none of these

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(viii) When a slider moves on a fixed link having curved surface, their instantaneous centre lies _____

    a) on their point of contact                b) at the centre of curvature
    c) at the centre of circle                   d) at the pin joint

(ix) In internal expanding shoe brake, the actuating force is usually provided by means of

    a) A hydraulic cylinder                   b) A cam mechanism
    c) both (A) and (B)                       d) None of the above

(x) The following is also known as flywheel or coupling

    a) Cone clutch                           b) Centrifugal clutch
    c) fluid clutch                           d) Disc clutch

(xi) The overdrive consists of _____ gear train.

    a) Simple                              b) compound
    c) Epicyclic                           d) Reverted

(xii) Identify the type of gears used to connect two non-parallel non-intersecting shafts

    a) spur gears                          b) helical gears
    c) spiral gears                         d) none of these

(xiii) The radial distance of a tooth from the pitch circle to the bottom of the tooth, is called

    a) dedendum                         b) addendum
    c) clearance                          d) working depth

(xiv) Identify, the incorrect relationship of gears

    a) Circular pitch × Diametral pitch = $\pi$       b) Module = P.C.D/No.of teeth
    c) Dedendum = 1.157 module            d) Addendum = 2.157 module

(xv) For a speed ratio of 100, smallest gear box is obtained by using

    a) a pair of spur gears                 b) a pair of helical and a pair of spur gear compounded
    c) a pair of bevel and a pair of spur gear compounded       d) a pair of helical and a pair of worm gear compounded

## Group-B
### (Short Answer Type Questions)
                                                    3 x 5=15

2. Explain different kind of Bearing Materials. (3)
3. Differentiate between a mechanism and a machine. (3)
4. Explain the following terms related with Governor - (i) Height (ii) Centrifugal Force (iii) Radius of rotation (3)
5. Discuss the advantages of a Cross belt drive. (3)
6. Consider a rope-brake dynamometer, which is attached to the crank shaft of IC engine, measures a brake power of 20 KW when the speed of rotation of the shaft is 400 rad/sec. Estimate the value of the shaft torque sensed by the dynamometer. (3)

### OR

Classify different types of Dynamometers. Illustrate its functional uses. (3)

## Group-C
### (Long Answer Type Questions)
                                                    5 x 6=30

7. Define "Creeping of the belt". What do you understand by "Crowning of Pulleys"? (5)
8. Define gear train. Discuss the different types of gear trains. (5)
9. A simple Watt governor rotates at 75 rpm. Calculate its vertical height and the change if the speed increases to 80 rpm. Also calculate the height at 75 rpm if the weight of the ball is 20 N and that of the arm 5 N. (5)
10. State and illustrate the fundamental law of gearing (5)

11. Four masses 150, 250, 200 and 300 kg are rotating in the same plane at radii of 0.25, 0.2, (5) 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).

12. Claasify the various types of brakes. Differentiate between a self-locking and self- (5) energizing brake.

**OR**

"Single-block or Shoe Brake is called self-locking type of break"-Illustrate and justify your (5) answer.

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