4054

BOARD DIPLOMA EXAMINATION, (C-14)

MARCH / APRIL - 2019

DME - FIRST YEAR EXAMINATION

ENGINEERING MECHANICS

Time : **3** Hours]   [Total Marks : **80**

PART - A   4×10=40

Instructions :   (1) Answer **ALL** questions.

(2) Each question carries **FOUR** marks (Two marks for each bit).

(3) Answer should be brief and straight to the point and shall not exceed five simple sentences.

1	(a)	State Lami's theorem.	2
	(b)	Define equilibrium of a body.	2
2	(a)	Define Coplaner forces.	2
	(b)	State triangular law of forces.	2
3	(a)	Define co-efficient of friction.	2
	(b)	Write any two effects of friction.	2
4	(a)	Define dynamic friction.	2
	(b)	Define the term angle of friction.	2
5	(a)	Define centre of gravity.	2
	(b)	Define moment of inertia.	2
6	(a)	State Newton's first law of motion.	2
	(b)	Define the term time of flight.	2
7	(a)	A car starts from rest and attains a velocity of 24 m/sec in 30 seconds. Find the acceleration.	2
	(b)	State the law of conservation of energy.	2

4054]   1   [Contd...

8   (a)   Define mechanical advantage.   **2**

      (b)   Give the examples for first order lever.   **2**

9   (a)   Write the expression for law of machine.   **2**

      (b)   There are three pulleys, in a system of pulleys of the   **2**
            first type. Find the velocity ratio.

10 (a)   Define lower pair.   **2**

      (b)   Give the mathematical relation between links and pairs.   **2**

PART - B   10×4=40

Instructions :   *(1)* *Answer any **FOUR** questions.*

                          (2) *Each question carries **TEN** marks.*

                          (3) *Answer should be comprehensive and the criterion for valuation is the content but not the length of the answer.*

11 (a)   Define the term moment.   **2**

      (b)   A particle is acted upon by the following forces :   **8**

            20 N inclined 30° to north of east

            25 N towards north

            30 N towards north-west

            35 N inclined at 40° to south of west

            Find the magnitude of the resultant.

12 (a)   Find the magnitude of two forces such that, if they act   **5**
            at right angle the resultant is $\sqrt{10}$ N, but if they act 60°
            their resultant is $\sqrt{13}$ N.

      (b)   Find the centroid of I-section for which, the bottom   **5**
            flange is 200 mm×40 mm, top flange is 100 mm×20 mm
            and for web, height is 240 mm, width is 20 mm.

13 (a) A body of weight 450 kN is hauled along a rough   **4**
        horizontal plane by a pull of 100 kN acting at an angle
        of 25° with the horizontal. Find the coefficient of friction.

    (b) A force of 40 kN pulls a body of weight 60 kN upon an **6**
        inclined plane. The force being applied parallel to the
        plane. The inclination of the plane to the horizontal is 30°.
        Calculate the coefficient of friction.

14 (a) State parallel axis theorem.   **3**

    (b) Find the moment of inertia of the angle section as   **7**
        shown in figure about X-X and Y-Y passing through
        its centre of gravity.
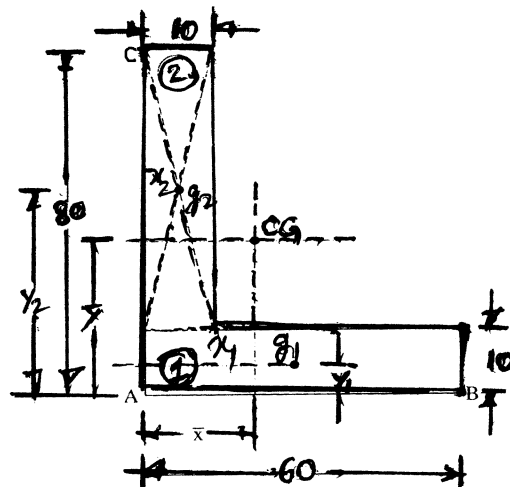
15 (a) Explain about D'Alembert's principle.   **4**

    (b) An engine capacity 1.5 MW acts on a body so that the   **6**
        velocity changes from 10 m/sec to 25 m/sec in 6 minutes.
        Calculate mass of the body.

16 (a) A body is projected vertically upwards attains a height **5**
        of 475 mm. Calculate the velocity of projection and
        compute the time of flight in the air.

    (b) A bullet is fired at an angle of 45° with the horizontal **5**
        with a velocity of 275m/s. How high the bullet will be
        raised.

17 (a) Draw a line diagram of third system of pulleys.   **4**

(b) A drum weighs 60 N and holding 400 N of water is   **6**
to be raised from a well by means of wheel and axle. The
diameter of axle is 100 mm and the diameter of wheel
is 400 mm. If a force of 120 N has to be applied to the
wheel. Find the mechanical advantage, velocity ratio and
efficiency.

18 (a) Write the differences between mechanism and machine.   **5**

(b) The law of machine is given by the relation,   **5**
P=0.04W+7.5, where P is the effort required to lift a load
of W, both are in Newtons. Determine mechanical advantage
and efficiency of the machine when load is 2kN and
velocity ratio is 40.

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