Total No. of printed pages = 7

END SEMESTER EXAMINATION – 2020

Semester : 2nd (New)

Subject Code : Me-201

ENGINEERING MECHANICS

Full Marks – 70

Time – Three hours

The figures in the margin indicate full marks for the questions.

Instructions :

1. *All* questions of PART–A are compulsory.
2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Fill in the blanks : 1×5=5

(a) _____ is that branch of Engineering Mechanics, which deals with the forces and their effects, while acting upon the body at rest.

[Turn over

(b) Magnitude of the force is one of the characteristics of a _____.

(c) The forces, whose magnitude is _____, is known as unit vector.

(d) If the arm of a couple is doubled, its moment will be _____.

(e) The centre of gravity of a cube is at a distance _____ from every face. (Where l is the length of each face).

2. Write true or false : 1×5=5

(a) The physical quantities are expressed in three fundamental quantities i.e. length, area and time.

(b) One of the characteristics of a couple is that it can cause a body to move in the direction of a greater force.

(c) A body is said to be in equilibrium, if it has no linear motion.

(d) If the efficiency of a machine is 100%, then it is an ideal machine.

(e) The unit of work done is joule.

3. Choose the correct answer : 1×5=5

(a) The centre of gravity of an equilateral triangle with each side (a) is _____ from any of the three sides.

(i) $a\sqrt{3}/2$

(ii) $a\sqrt{2}/3$

(iii) $a/2\sqrt{3}$

(iv) $a/3\sqrt{2}$

(b) Theorem of perpendicular axis is used in obtaining the moment of inertia of a

(i) triangular lamina

(ii) square lamina

(iii) circular lamina

(iv) semicircular lamina

(c) In a simply supported beam carrying triangular load, the reactions cannot be vertical

(i) true

(ii) false

(d) The relationship $s = ut+1/2at^2$ is applicable to bodies

(i) moving with any type of motion

(ii) moving with uniform velocity

(iii) moving with uniform acceleration

(iv) Both (i) and (ii)

(e) The potential energy of a mass (m) kg raised through a height (h) metres is

(i) mgh newtons

(ii) mh newtons

(iii) gh newtons

(iv) None of these

4. Match the following : 1×5=5

(a) The moment of inertia of a circular section of diameter (d) is given by	(i) whose line of action are parallel to each other and all of them act in the same direction.
(b) Angular velocity is the	(ii) $\pi/64\ (d^4)$

(c) Like parallel forces	(iii) μ×Normal reaction
(d) Force of friction, F is equal to	(iv) rate of change of angular displacement of a body.
(e) Efficiency of a machine is equal to	(v) Output/Input ×100

5. Answer in one sentence each : 1×5=5

(a) What is Coplanar Concurrent forces ?

(b) What is vector quantities ?

(c) Define clockwise moments.

(d) What is Coefficient of friction ?

(e) What is Pitch of a screw ?

PART – B

Marks – 45

6. (a) Distinguish clearly between resolution of forces and composition of forces. 4

(b) Two forces act at an angle 120°. The bigger force is 40N and resultant is perpendicular to the smaller one. Find the smaller force. 5

7. (a) What is meant by moment of a force ? 1

(b) How will you represent the moment of a force geometrically ? 3

(c) Four forces equal to P, 2P, 3P and 4P are respectively acting along the four sides of square ABCD taken in order. Find the magnitude, direction and position of the resultant force. 5

8. (a) Explain the conditions of equilibrium. 2

(b) State the Lami's theorem. 2

(c) A rope connected between two points A and B 120 cm apart at the same level. A load of 200 N is suspended from a point C on the rope 45 cm from A. Find the load, that should be suspended from the rope D 30 cm from B, which will keep the rope CD horizontal. 5

9. (a) Distinguish between centre of gravity and centroid. 3

(b) What is axis of reference ? 1

(c) Find the centre of gravity of a T-section with flange 150mm×10mm and web 150mm ×10mm. 5

10. (a) What do you understand by the term friction ? 1

(b) How will you distinguish between static friction and dynamic friction ? 3

(c) A load of 1.5 kN, resting on an inclined rough plane, can be moved up the plane by a force of 2 kN applied horizontally or by a force 1.25kN applied parallel to the plane. Find the inclination of the plane and the coefficient of friction. 5

11. (a) Define law of machine. Explain in brief. 2

(b) In a weight lifting machine, an effort of 40 N can lift a load of 1300 N and an effort of 55 N can lift a load of 1800 N. Find the law of machine. Also find the effort to run this machine at : 5

(i) No load

(ii) A load of 100 N.

(c) Describe a simple wheel and axle. 2