END SEMESTER / RETEST EXAMINATION,2019
Semester : 2nd
Subject code: Me-201
Subject: ENGINEERING MECHANICS
Full Marks: = 70
Duration: 3 hours

Instructions:
1. Questions on Part A are compulsory
2. Answer any five questions from Part B

PART-A
MARK-25

1. Fill in the blanks: 1x10=10

a. The method of designating a force by writing two capital letters one on either side of force is called _____.
b. The centre of gravity of a triangle is at the point where _____medians meet.
c. Sliding friction is experienced by a body when it slides _____another body.
d. The unit of acceleration is _____.
e. The unit of work done is _____.
f. If momentum = mass(Kg) X velocity(m/s), then the unit of momentum is _____.
g. In a simple wheel and axle lifting machine, V.R =_____.
h. For an Ideal machine, the efficiency of a machine is _____%.
i. Lami's Theorem is applicable only for _____ forces.
j. A load, acting at a point on a beam is known as _____ load.

2. Write true or false 1x10=10

a. The vector method, for the resultant force, is also called polygon law of forces.

b. The centre of gravity of a cube is at a distance l/2 from every face (where l is the length of each side).
c. If area is in m^2 and length is in m, then moment of inertia is expressed in m^3.
d. Law of machine is given by the relation P=m W+ C
e. 1 Watt power = 1 N-m/s.
f. A channel section is symmetrical about Y-axis.
g. In a simply supported beam carrying triangular load, the reactions cannot be vertical.
h. A lifting machine having an efficiency less than 50% is known as non-reversible machine.
i. The efficiency of a screw jack may be increased by increasing its pitch.
j. The force of friction always acts in a direction same to that in which the body tends to move.

3. Choose the correct answer: 1x5=5

a. If the sum of all the forces acting on a body is zero, then the body may be in equilibrium provided the forces are
(i) Concurrent (ii) Parallel
(iii) Like parallel (iv) Unlike parallel

b. The resultant of two forces P and Q acting at an angle θ is equal to
(i) $\sqrt{(P^2+Q^2+2PQ\sin\theta)}$
(ii) $\sqrt{(P^2+Q^2-2PQ\cos\theta)}$
(iii) $\sqrt{(P^2+Q^2-2PQ\sin\theta)}$
(iv) $\sqrt{(P^2+Q^2+2PQ\cos\theta)}$

c. The scalar quantities are those quantities which have
(i) Both magnitude and dimension
(ii) Magnitude only
(iii) Dimension only

d. The forces which meet at one point and their lines of action also lie on the same plane, are known as
(i) Coplanar forces
(ii) Concurrent forces
(iii) Coplanar Concurrent forces
(iv) Coplanar non-concurrent forces

e. Two forces P and Q are acting simultaneously at a point. If the angle between the two forces are zero degree, what is the resultant of these forces?
(i) R=P+2Q (ii) R=P- Q
(iii) R=2P+2Q (iv) R=P+Q

PART-B, MARK- 45

4.
a. Define a force. 1
b. State the characteristics of a force. 2
c. The forces 20N, 30N, 40N, 50N and 60N are acting at one of the angular points of a regular hexagon, towards the other five angular points, taken in order. Find the magnitude and direction of the resultant force. 6

5.
a. Distinguish between static and dynamic friction. 2+2=4
b. A body of weight 300N is lying on a rough horizontal plane having a coefficient of friction as 0.03. Find the magnitude of the force, which can move the body, while acting at an angle of 30° with the horizontal. 5

6.
a. State and prove the theorem of perpendicular axis applied to moment of inertia. 3
b. Find the moment of Inertia of a rectangular sector 60mm wide and 40mm deep about its centre of gravity. 6

7.

a. Define the term Centre of Gravity. 2

b. How many centres of gravity a body has? 1

c. An I- section has the following dimensions in mm units: 6

Bottom flange =300×100

Top flange=150×100

Web=300×100

Determine mathematically the position of C.G of the section.

8.

a. Derive the relation among the V.R, M.A and η of a machine. 4

b. Find the Law of machine in which an effort of 15.5 N raised a load of 70 N and an effort of 19.5 N raised a load of 90N. Find the effort to lift a load of 100N. 3+2=5

9.

a. Describe briefly the different types of end supports of beams with a neat diagram. 3

b. A simply supported beam of span 6m is carrying a uniformly distributed load of 2KN/m over a length of 3m from the right end B. Calculate the support reactions. 6

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