

Register Number:

B.E/B.TECH DEGREE EXAMINATIONS: MAY/JUNE 2014

(Regulation 2009)

Second Semester

MEC102: ENGINEERING MECHANICS

(Common to AERO, AUTO,CE, ME, MCT, FT, BIO & TXT)

Time: Three Hours

Maximum Marks: 100

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. The sum of two vectors is
 - a) a scalar
 - b) a vector
 - c) a pure number
 - d) none of these
2. Collinear forces are
 - a) concurrent
 - b) coplanar
 - c) concurrent and coplanar
 - d) none of these
3. Self weight of a block resting on an incline will act
 - a) vertically downwards
 - b) horizontally
 - c) along the incline
 - d) normal to the incline
4. When trying to turn a key into a lock, the following is applied
 - a) coplanar force
 - b) non-coplanar force
 - c) lever
 - d) couple
5. Magnitude of a vector quantity is
 - a) its dot product with unit vector along its direction
 - b) its cross product with unit vector along its direction
 - c) both (a) and (b)
 - d) none of these
6. Belt friction is a variety of
 - a) static friction
 - b) rolling friction
 - c) kinetic friction
 - d) surface tension
7. Walking on ice is tough due to
 - a) absence of sufficient warmth
 - b) absence of sufficient frictional resistance
 - c) presence of scrolling sunlight
 - d) presence of cold
8. The unit of coefficient of friction is
 - a) mm
 - b) N-mm
 - c) second
 - d) None of these
9. Centrifugal force is
 - a) real force
 - b) not an inertial force
 - c) fictitious force
 - d) none of these

10. Working principle of jet engine is
 - a) conservation of mass
 - b) conservation of energy
 - c) conservation of angular momentum
 - d) none of these

PART B (10 x 2 = 20 Marks)

11. Define statics and dynamics
12. What is trajectory motion?
13. Explain the term "Resultant".
14. Give some examples for vector quantities.
15. State varignon's principle
16. A horizontal bar of 7m long have been supported at its ends (A & B) and has a force of 7kN at the centre and 8kN acts 6m from front end. Find reaction at A.
17. Give the classification of beams.
18. What are the methods in practice to determine the centre of gravity of simple figures?
19. What is limiting friction?
20. What are types of belt drives?

PART C (5 x 14 = 70 Marks)

21. a) (i) State and prove Lami's theorem (7)
(ii) Two forces of 80N and 70N acts simultaneously at a point. Find the resultant forces, if the angle between is 150° (7)

(OR)

- b) Determine the resultant of the three forces acting on the hook as shown (fig 1)

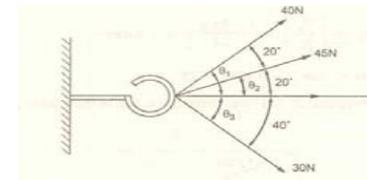


Fig.1

22. a) A book weighing 30N is resting on a smooth table, as shown in (fig 2). Draw the free body diagram of (i) the book and (ii) the table.

Fig : 2

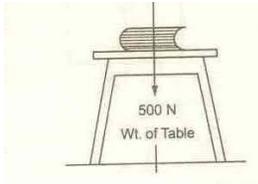


Fig.2

(OR)

- b) A simply supported beam of span 7m carries uniformly varying load from Zero at end A to 700N/m at end B. Calculate the reactions at the two ends of the support .
23. a) Using the analytical method, determine the centre of gravity of the plane uniform lamina shown in (fig 3). All dimensions are in mm.

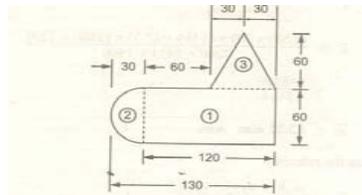


Fig.3

(OR)

- b) A body consists of a right circular solid cone of height 50mm and radius 35mm placed on a hemisphere of radius 35mm of a same material. Find the position of centre of gravity of the body.

24. a) (i) A body of weight 70N is placed on a rough horizontal plane. To just move the body on the horizontal plane, a push of 20N inclined at 20° to the horizontal Plane is required. Find the coefficient of friction (7)
- (ii) A body of weight 400N is lying on a rough plane inclined at an angle of 23° with the horizontal. It is supported by an effort (P) (upward) parallel to the plane. Determine the minimum and maximum value for P, for which the equilibrium can exist, if angle of friction is 20° (7)

(OR)

- b) (i) A pulley is driven by a flat belt running at a speed of 600m/min. The coefficient of friction between the pulley and the belt is 0.3 and the angle of lap is 160° . If the maximum tension in the belt is 700N; find the power transmitted by a belt (7)
- (ii) A body of weight 250N is kept in position on a plane inclined 25° to the horizontal by a horizontally applied force (P). Determine the minimum magnitude of the force (P) if the value of μ is 0.25. (7)

25. a) The equation of motion of particle moving in a straight line is given by $S = 15t + 3t^2 - t^3$, where s is in metres and t is in seconds. Find i) the velocity and acceleration at start, ii) the time, when the particle reaches its maximum velocity, iii) the maximum velocity of the particle, and iv) acceleration, when velocity is Zero

(OR)

- b) (i) A bullet of mass 100gm is fired into a freely suspended target mass 5kg. On impact, the target moves with the velocity of 5m/sec along with the bullet in the direction of firing, Find the velocity of bullet. (7)
- (ii) A horse pulling the cart exerts a steady horizontal pull of 250N and walks at a rate of 4kmph. How much work done by the horse in 10 minutes? (7)
