Reg. No. :

Question Paper Code: 43705

B.E. / B.Tech. DEGREE EXAMINATION, MAY 2018

Third Semester

Mechanical Engineering

14UME305 - ENGINEERING MECHANICS

(Regulation 2014)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The resultant of two forces P and Q acting at an angle θ is equal to

    (a) $\sqrt{P^2 + Q^2 + 2PQ \sin\theta}$ (b) $\sqrt{P^2 + Q^2 - 2PQ \cos\theta}$

    (c) $\sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ (d) $\sqrt{P^2 + Q^2 + 2PQ \tan\theta}$

2. The forces, which meet at one point and their lines of action also lie on the same plane, are known as

    (a) Coplanar concurrent forces   (b) Coplanar non-concurrent forces

    (c) Non – coplanar concurrent forces   (d) Non-coplanar non-concurrent forces

3. How many reaction forces in the fixed support?

    (a) 1   (b) 2   (c) 3   (d) 4

4. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to

    (a) Area of triangle   (b) Twice the area of triangle

    (c) Half the area of triangle   (d) None of these

5. The path of the projectile is

    (a) Hyperbola   (b) Parabola   (c) Involutes   (d) Epi-cycloid

6. Moment of inertia is the
    (a) Second moment of force   (b) Second moment of area
    (c) Second moment of mass   (d)Second moment of weight

7. The bodies which rebound after impact are called

    (a) Inelastic bodies   (b) Elastic bodies

    (c) Neither elastic nor inelastic   (d) None of these

8. The law of motion involved in the recoil of gun is

    (a) Newton first law of motion   (b) Newton second law of motion

    (c) Newton third law of motion   (d) None of these

9. The force required to move the body up the plane will be minimum, if it makes an angle with the inclined plane _____the angle of friction.

    (a) Equal to   (b) Less than

    (c) Greater than   (d) None of these

10. The linear acceleration (a) of a body rotating along a circular path of radius (r) with an angular acceleration of α rad / s^2, is

    (a) $a = \alpha/ r$ (b) $a = \alpha.r$ (c) $a = r / \alpha$ (d) none of these

PART - B (5 x 2 =10 Marks)

11. What is the difference between a resultant force and equilibrant force?

12. Distinguish between statics and dynamics with examples.

13. Explain polar moment of inertia.

14. What is Impulse of force?

15. Explain limiting friction.

PART - C (5 x 16 = 80 Marks)

16. (a) Two forces equal to 2F and F act on a particle. If the first force be doubled and the second increased by 15 N, the direction of the resultant remains unaltered. Find the value of F.   (16)

Or

    (b) Particle 'O' is acted on by the following forces Determine the resultant force.
        (i)   20 N inclined 30° North of East
        (ii)   25 N towards North
        (iii)   30 N towards North West
        (iv)   35 N inclined 40° to South of West, Find the resultant. (K2)   (16)

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17. (a) Three smooth pipes each weighing 20 KN and of diameter 60 cm are to be placed in a rectangular channel with horizontal base as shown. Calculate the reactions at the points of contact between the pipes and between the channel and the pipes. Take width of channel as 160 cm. (16)
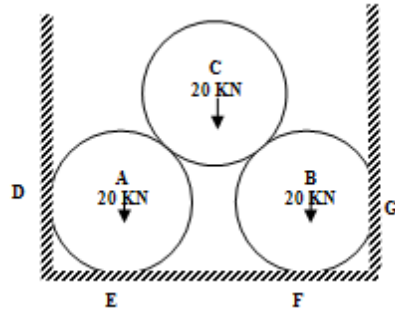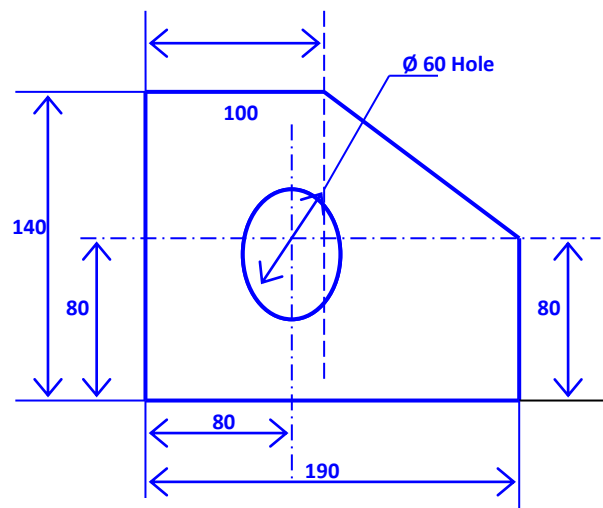

Or

(b) Find the pin reaction at *A* and the knife-edge reaction at *B*. (16)
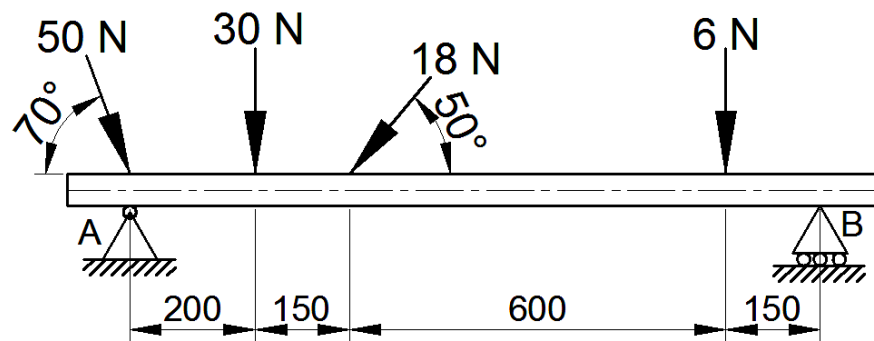
All Dimensions are in 'mm'

18. (a) Locate the centroid of the sectioned area shown in figure. (16)

All dimensions are in mm

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Or

(b) Find the moment of inertia of a T section of flange 100 mm x 30 mm and web 20 mm x 80 mm about its centroidal axes. (16)

19. (a) (i) A car starts from rest with a constant acceleration of 4 m/s2. Determine the distance traveled in the 7th second. (8)

(ii) A body was thrown vertically down from a tower and travels a distance of 3 m in the 5th second of its flight. Find the initial velocity of the body. (8)

Or

(b) A car of mass 300 kg is traveling at 36 km/h on level road. It is brought to rest, after traveling a distance of 5m. What is the average force of resistance acting on the car? Find it by applying. (16)

(i)   Law of conservation of Energy
(ii)   Work-Energy method
(iii)   D-Alembert's principle

20. (a) What should be the value of the angle θ so that motion of the 390 N block impends down the plane? The co-efficient of friction μ for all surfaces is 1/3. (16)
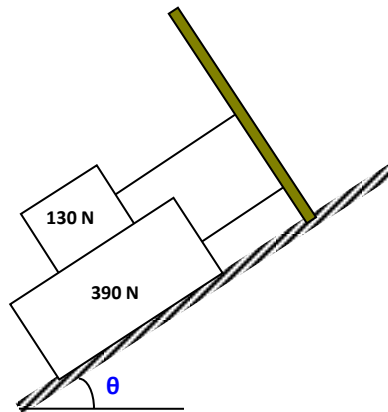
Or

(b) A pull of 250N inclined at 30° in the horizontal plane is required just to move a body kept on a rough horizontal plane. But the push required just to move the body is 300N. If the push is inclined at 30° to the horizontal, find the weight of the body and the coefficient of friction. (16)

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