Reg. No. :

Question Paper Code: 43705

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. Forces are called concurrent when their line of action meet in

   (a) One point   (b) Plane
   (c) Perpendicular plane   (d) Different plane

2. A force acting on a body may

   (a) Introduce internal stresses   (b) Balance the other forces acting on it
   (c) Retard its motion   (d) All the above

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 first and second differentiation of an equation of displacement in terms of time, with respect to time, the equation so obtained will give in the order of

    (a) displacement and velocity   (b) displacement and acceleration

    (c) acceleration and velocity   (d) velocity and acceleration

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 maximum frictional force, which comes into play, when a body just begins to slide over the surface of the other body, is known as

    (a) static friction   (b) dynamic friction

    (c) limiting friction   (d) coefficient of friction

10. Linear velocity of a body rotating at ω rad/sec along a circular path of radius r is given by

    (a) ωr (b) $\omega^2 r$ (c) $\frac{\omega}{r}$ (d) $\frac{\omega^2}{r}$

PART - B (5 x 2 =10 Marks)

11. Define equivalent system of forces.

12. Distinguish between a moment and a couple.

13. Define radius of gyration.

14. What is Impulse of force?

15. Explain limiting friction.

PART - C (5 x 16 = 80 Marks)

16. (a) Determine the length of the cord AC in figure below so that the 8 kg lamp is suspended in the position shown. The undeformed length of the spring AB is 0.4 m and the spring has a stiffness of 300 N/m.   (16)

Or

2

43705
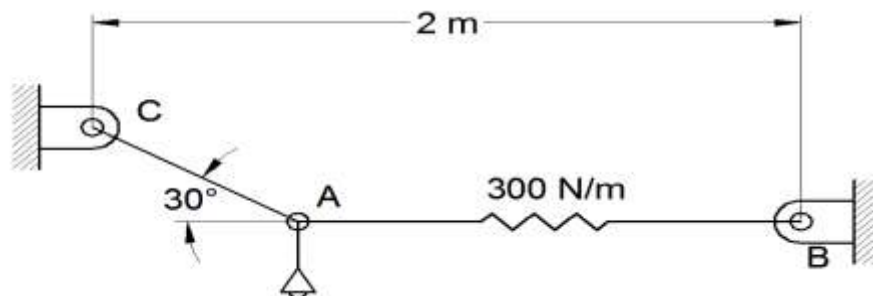
(b) Particle 'O' is acted on by the following forces Determine the resultant force.
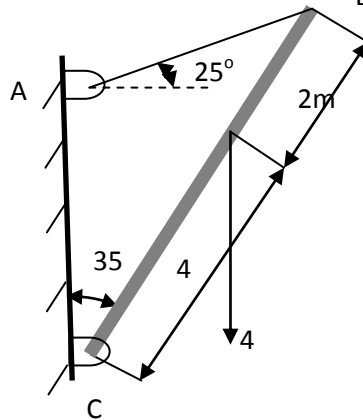- (i)   20 N inclined 30° North of East
- (ii)   25 N towards North
- (iii) 30 N towards North West
- (iv) 35 N inclined 40° to South of West, Find the resultant. (K2)   (16)
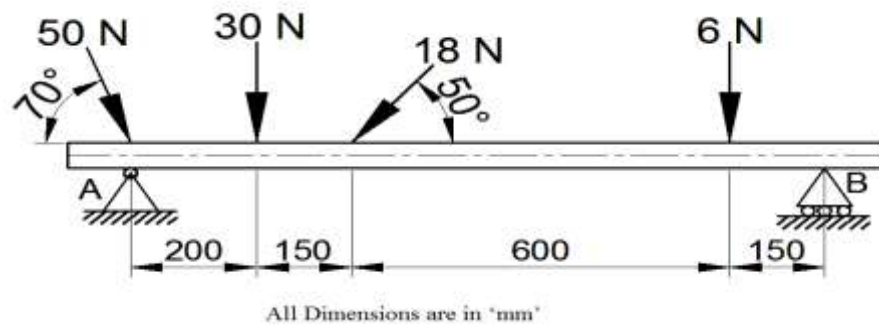
17. (a) 4000 *N* load acts on the beam held by the rope *AB* as shown in below figure. The weight of the beam *BC* can be neglected. Draw the free body diagram of the beam and find the tension in the cable *AB*. Also find the reaction force at *C*.   (16)
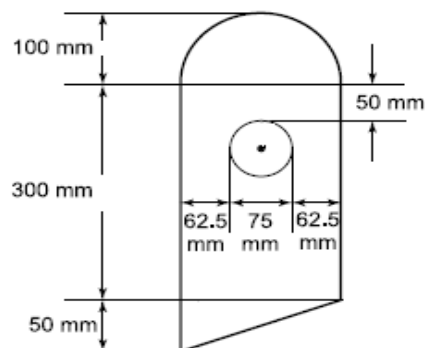

Or

(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 plane area shown in figure.   (16)

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) A particle under constant deceleration is moving in a straight line and covers a distance of 20 *meters* in the first 2 *seconds* and 40 *meters* in the next 5 *seconds*. Calculate the distance it covers in subsequent 3 *seconds* and the total distance travelled by the particle before it comes to rest. (16)

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) Block *A* weighing 750 *N* rests over block *B* which weighs 1250 *N* as shown in Figure 6. Block *A* is tied to wall with a horizontal string. If the coefficient of friction between block *A* and block B is 0.25 and between block *B* and the floor is 1/3. Calculate the value of *P* to move the block. (16)
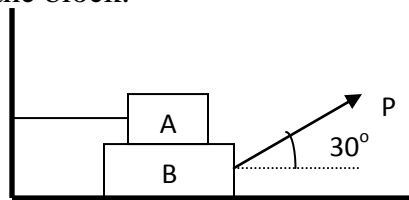
Or

(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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43705