Reg. No. : | | | | | | | | | | |

Question Paper Code: 41735

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

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. 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. The reactions for a fixed supports are

   (a) R_x (b) R_x, R_y and M (c) R_x and R_y (d) None of these

4. Couple produces

   (a) Translatory motion (b) Rotational motion
   (c) Combined translator and rotational motion (d) None of the above

5. The centre of gravity of a hemisphere of radius "r" from its base measured along the vertical radius is

   (a) 3/8r (b) 3r/8 (c) 8/3r (d) 8r/3

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 total motion possessed by a body, is called

(a)moment (b) mass (c) weight (d) momentum

9. The force of friction always acts in a direction opposite to that

(a) In which the body tends to move (b) In which the body is moving
(c) Both (a) and (b) (d) None of the (a) and (b)

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

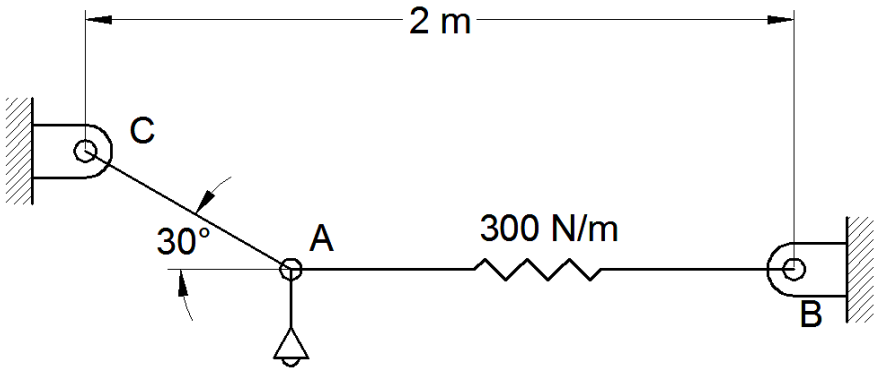
(a)ωr (b)$\omega^2 r$ (c)$\frac{\omega}{r}$ (d)$\frac{\omega^2}{r}$

PART - B (5 x 2 =10 Marks)

11. Define equivalent system of forces.
12. Explain Varignon's theorem.
13. Define mass moment of inertia.
14. What is Impulse of force?
15. Define angle of repose and angle of friction.

PART - C (5 x 16 = 80 Marks)

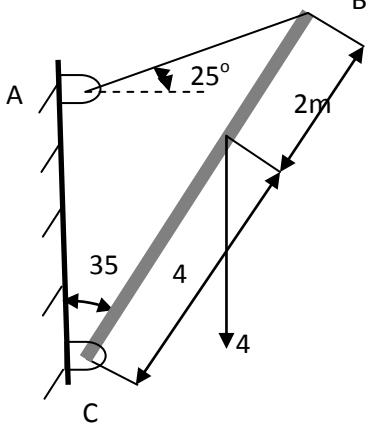
16. (a) Determine the length of the cord *AC* in figure below so that the 8 *kg* lamp is suspended in the position shown. The undeformed length of the spring *AB* is 0.4 *m* and the spring has a stiffness of 300 *N/m.* (16)



Or

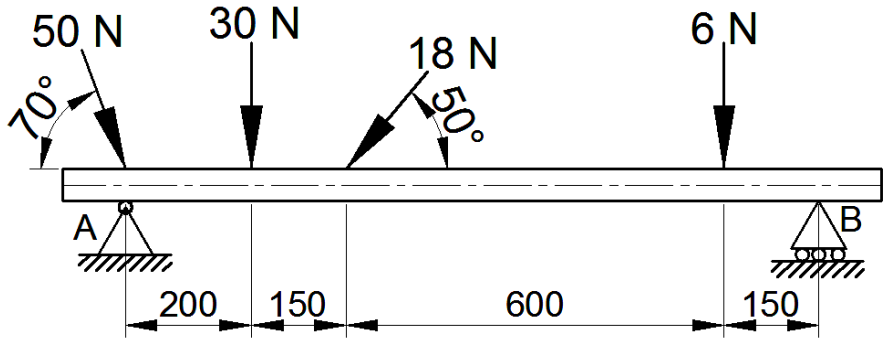
(b) Three forces are acting at point *A* (4, 6, -4). If *B* (3, 6, 2) is a point on the line of action of the force F_1 = 40 *kN*, *C* (-3, 4, -5) is a point on the line of action of the force F_2 = 50 *kN* and *D* (-5, -6, 8) is a point on the third force F_3 =60 *kN*, determine the resultant of the three forces. (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)



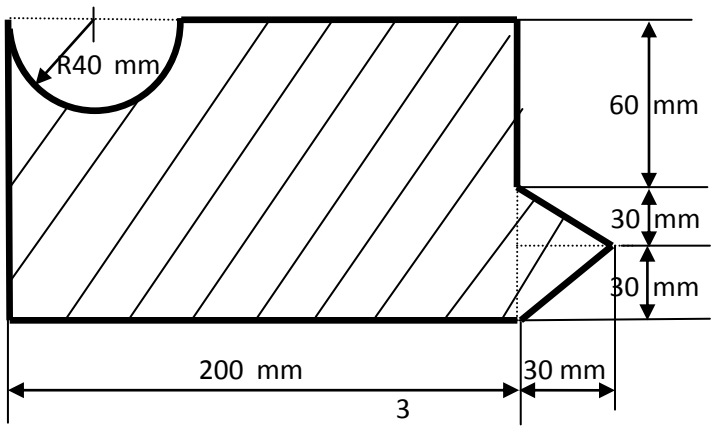
Or

(b) Find the pin reaction at *A* and the knife-edge reaction at *B*. (16)



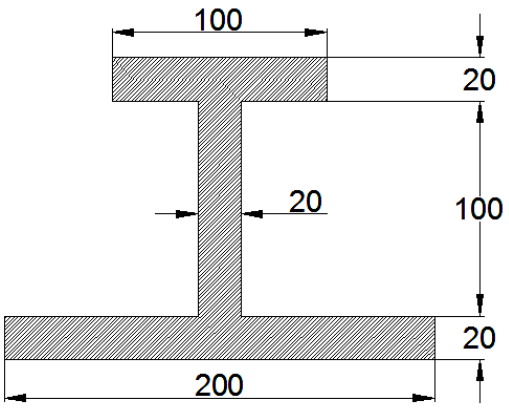
All Dimensions are in 'mm'

18. (a) Determine the coordinates of the centroid of the plane area shown in below figure. (16)



Or

(b) Find the moment of inertia of the section shown in figure about the centroidal axis *XX* perpendicular to web. (16)



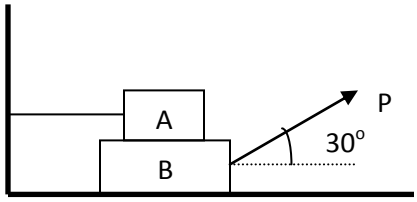
All Dimensions are in 'mm'

19. (a) A car starts from rest and accelerates uniformly to a speed of 80 *kmph* over a distance of 500 *m*. Find time and acceleration. Further acceleration raises the speed to 96 *kmph* in 10 *seconds*. Find the acceleration and distance. Brakes are applied to bring the car to rest under uniform retardation in 5 *seconds*. Find the distance covered during braking. (16)

Or

(b) A body weighing 200 *N* slides up a 30^o inclined plane under the action of an applied force of 300 *N* acting parallel to the plane. The coefficient of friction is 0.2. The body moves from rest. Determine at the end of the 4 *seconds*, the acceleration, distance travelled, velocity, kinetic energy, work done, momentum and impulse applied on the body. (16)

20. (a) Block *A* weighing 750 *N* rests over block *B* which weighs 1250 *N* as shown in below figure. 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 right circular cylinder of weight 100 *N* and radius 200 *mm* is suspended from a cord that wound around its circumference. If the cylinder is allowed to fall freely, find the acceleration of its mass center and tension in the cord. (16)