Code: ME2T4, AE2T4

I B.Tech - II Semester – Regular/Supplementary Examinations April - 2018

ENGINEERING MECHANICS-II
(Common for ME & AE)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks

$$11 \times 2 = 22 \text{ M}$$

1.
  a) Explain the types of motion with suitable examples.
  b) Derive the equation of path of projectile motion.
  c) State the work energy principle.
  d) Define fixed axis rotation and give examples.
  e) List equilibrium equations for rotation under the action of constant moment.
  f) Calculate Mass moment of Inertia of a rectangular plate of Base 8cm and height 12cm about its base, thickness is 2cm where the density of the material is 2000kg/m^3.
  g) Find the velocity of projection of a ball, which has a horizontal range of 60m if its time of flight for the range is 3 seconds.
  h) State D Alembert's Principle.
  i) What are the effects of general plane motion on rigid bodies?

j) Define mass moment of inertia and what is its significance in rotational motion?

k) A cylinder of radius 15 mm rolls without slipping on the surface of a conveyor belt which is moving at 60mm/s. Determine the velocity of point A.

$w = 15\ rad/s$

$v = 60\ mm/s$
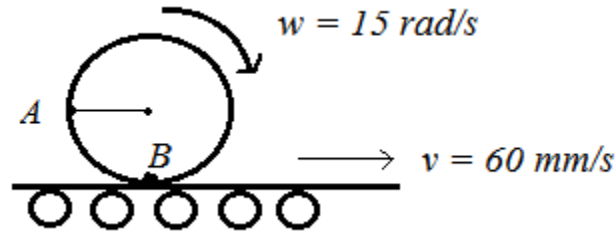
PART – B

Answer any **THREE** questions.   All questions carry equal marks.

3 x 16 = 48 M

2. a) A stone is dropped into a well with no initial velocity and 4.5 sec later the splash is herd. Then a second stone is thrown downward into the well with an initial velocity V_0 and the splash is heard in 4.0 sec. If the velocity of sound is constant at 242 m/s, determine the initial velocity of the second stone.   8 M

b) The acceleration of a particle is defined by the relation $a = 25\text{-}3s^2$ mm/s^2. The particle starts with no initial velocity at the position s=0. Determine

i) the velocity when s=2mm

ii) the position when velocity is again zero.

iii) the position where velocity is maximum and the corresponding maximum velocity.   8 M

3. a) A bullet of mass 91 grams and moving with a velocity of 300m/s is fired into a log of wood and it penetrates to a depth of 10 cm. If the bullet moving with the same velocity, were fired in to a similar piece of wood 5 cm thick, with what velocity it emerge? Find also the force of resistance, assuming to be uniform.   8 M

b) Ball A has a mass of 3 kg and is moving with a velocity of 8 m/s when it makes a direct collision with ball B, which has a mass of 2 kg and is moving with a velocity of 4 m/s. if e=0.7, determine the velocity of each ball just after the collision. Neglect the size of the balls.   8 M
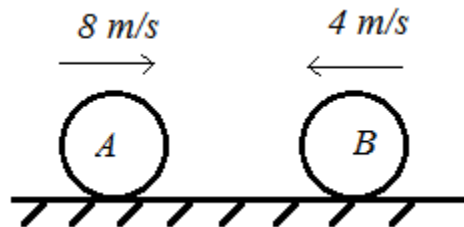
4.   Determine the mass moment of inertia of a solid cone of radius 'r' , height 'h' and mass 'm' about x and y axis.

16 M

5.   A flywheel that is rotating at 300 rpm attains a rotational rate of 180 rpm after 20 seconds. Determine the angular retardation of the fly wheel assuming it to be uniform. Also determine the time taken to come to rest from a speed of 300 rpm if the retardation rate remains the same and the number of revolutions made during this time.   16 M

6. A woman of mass m stands in a boat of mass M. If she jumps horizontally with a velocity of 'v' relative to the boat, determine the velocity of boat immediately after she jumps off the boat. 16 M