

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/ Backlog), May 2016

B. Tech, Semester II

Roll No.....

COURSE CODE: ME-201 Engineering Mechanics

Time: 3 hours

Max. Marks: 100

Instructions to students:

1. Do not write anything other than your roll number on question paper.
2. Assume suitable data wherever required and mention it clearly.
3. Writing appropriate units, nomenclature, and drawing neat sketches/schematics/ flow chart wherever, required are an integral part of the answer.

Q.1A Multiple choice questions (10 questions @ 1 mark)

10

1. Coplanar forces are
(a) Concurrent (b) non-concurrent (c) either concurrent or non-concurrent
(d) none of these.
2. The second moment of area about centroidal x-axis of a rectangle having width b and height h will be
(a) $bh^3/12$ (b) $hb^3/12$ (c) $bh^3/3$ (d) $hb^3/3$
3. If point of application of force moves in a direction normal to the force, the work done is
(a) zero (b) positive (c) negative (d) none of these
4. If the dot product of two vectors is zero then, we can conclude that :-
(a) vectors are parallel (b) vectors are mutually perpendicular
(c) vectors are collinear (d) none of these
5. A particle is rest at the origin. It moves along the axis with the acceleration $x-x^2$ where ax is the distance of the particle at time t. the particle next comes to rest after it had covered a distance of
(a) 10 units (b) 20units (c) 30units (d) 40units
6. I_{zz} of a circular having of diameter D about Z-axis perpendicular to x-y plane is equal to
(a) $\pi D^4/64$ (b) $\pi D^4/32$ (c) $\pi D^4/16$ (d) $\pi D^4/4$
7. Vector $A = 2i + 3j + 4k$, $B = -2i + 2j + 3k$ then $A \cdot B = \dots\dots\dots$
8. If the body slides down an incline, the acceleration of the body is given by
(a) g (b) $g \sin x$ (c) $g \cos x$ (d) $g \tan x$
9. Generally the motion of of a particle is described by
(a) principle of work -energy alone
(b) principle of Newtons law alone
(c) principle of work -energy or impulse-momentum or momentum or Newtons law
(d) none of these



10. A bullet of mass 0.1 kg is fired with a velocity of u from a gun of mass 10kg. the ratio of kinetic energy of the bullet and gun is
 (a) 1 (b) 10 (c) 100 (d) 1000

Q.2 Short answer type questions (4 questions @ 2.5 marks)

10

State parallel axis theorem

State theory of transmissibility

Coefficient of restitution

Angle of friction.

Q.3A Define friction and laws of friction

05

Q.3B A particle moves in x-y plane such that, $V_x = 2t + 6$ and $V_y = 3t^2 - 18t + 27$. If the particle is in the position (9, 27) at $t=0$, determine the equation of its path and also linear acceleration at $t=4s$.

05

Q.4A A block of weight $W_1 = 100N$ rests on a horizontal surface and supports on top of it another block of weight $W_2 = 50N$. The block W_2 attached with vertical wall by the straight string parallel to horizontal surface. Find the amount of the horizontal force P , applied to the lower block necessary for impending slipping. The coefficient of friction for all contiguous surface is 0.3

05

Q.4B A rifled gun fires a bullet with a muzzle velocity of 237m/s. To strike the enemy at a horizontal distance of 5 km at a height of approx 350m. What is the angle of projection

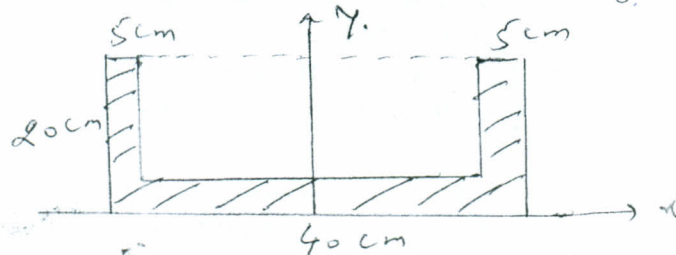
05

Q.5A The velocity -time relationship of a moving particle is given by the equation $X = 1/2ct^2$ where $c = 2.4m/s^2$. Determine the displacement of the particle at the instant $t=3sec$, if there was no initial displacement

05

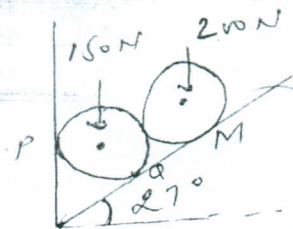
Q.5B Determine the centroid of the shaded area shown in fig.

05



Q.6A Two spheres are kept within a conical channel as shown in fig. All contact surfaces are smooth. Determine all contact reactions. Size of spheres are same but with different weight.

05



- Q.6B Derive the expression for the Efficiency, MA VR for the single purchase winch crab. 05
- OR
- Q.6B Determine the second moment of area of a rectangle about centroidal axes and about two edges. 05
- Q.7A A 10 kg weight is dropped on a vertical spring from 13cm height. Determine the maximum deflection of the spring if stiffness of the spring becomes 0.57N/mm. 05
- Q.7B A ball of mass 2 kg moving with the velocity of 1.5m/s strikes directly on a ball of mass 4 kg at rest. The ball A after striking the ball B comes to rest. Find the velocity of the ball B after striking and the coefficient of restitution. 05
- OR
- Q.7B Prove that two perfect elastic bodies of equal masses exchange velocities in the case of direct impact. 05
- Q.8A The simply supported beam AB carries a point load of 6kN at a distance of 3m from A. the span of beam is 8m. Using the principle of virtual work, find the reactions. 6+4
- Define concurrent and non concurrent forces.
- Q.9A The equation of motion of a car is given by the expression $S=20t+2t^2-t^3$ where S in meters and t is in seconds. Determine the (i) the velocity and acceleration from the start (ii) the maximum velocity and time at which maximum velocity occurs (iii) displacement, velocity and acceleration at the end of 5 sec. 10
- Q.9B Derive the equation of trajectory of projectile in horizontal plane. And further get the relation for maximum height, time of flight and range of projectile. (With neat diagram) 10
- OR
- Q.9B Derive the efficiency of screw jack. And also further derive the condition for maximum efficiency. (with neat and clean diagram showing all forces) 10

