

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (Regular/Backlog), April- 2015

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.	If the angle of friction is zero then, (a) the force of friction is zero. (b) the force of friction will be infinite. (c) the force of friction will act normal to the plane. (d) none of the above.	
2.	A body will begin to move down an inclined plane of the angle of inclination of the plane is..... than the angle of friction.	
3.	If the point of application of the force moves in the same direction of the motion of the body, the work done will be (a) positive (b) negative (c) zero (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.	Vector $A = 5i + 3j + 4k$, $B = -2i + 2j + 9k$ then $A \times B =$	
6.	Generally the motion of a particle is described by (a) principle of work -energy alone (b) principle of Newton's law alone (c) principle of work -energy or impulse-momentum or momentum or Newtons law (d) none of these	
7.	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	
8.	Tension in a cable supporting a lift (a) is more when the lift is moving upwards (b) is less when the lift is moving upwards (c) is less when the lift is moving downwards	

- (d) is constant whether the lift moves upwards or downwards.
9. I_{zz} of a circular having of diameter D about Z -axis perpendicular to x - y plane is equal to
 (a) $\frac{\pi D^4}{64}$ (b) $\frac{\pi D^4}{32}$ (c) $\frac{\pi D^4}{16}$ (d) $\frac{\pi D^4}{4}$
10. The coefficient of restitution for elastic bodies is
 (a) one
 (b) between zero and one
 (c) zero
 (d) none of the above.



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

10

Define the term coefficient of restitution.

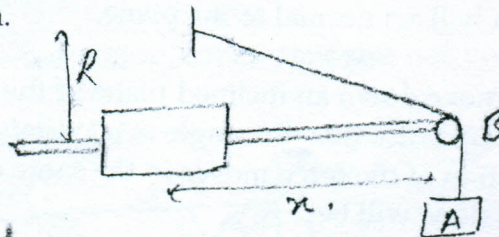
State perpendicular axis theorem

Angle of friction

Law of friction

Q.3A If end B is moving with a constant velocity v determine the velocity of block A in terms of v , x and h .

05

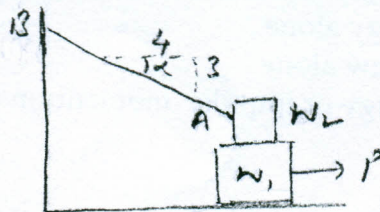


Q.3B State and prove Lami's theorem.

05

Q.4A A block of weight $W_1 = 200\text{N}$ rests on a horizontal surface and supports on top of it another block of weight $W_2 = 50\text{N}$. The block W_2 attached with vertical wall by the string AB, shown in fig. 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 system consisting of a large block of mass 15kg and a small block of mass 5kg is connected with an inclined chord is pulled by a force of 80N as shown in fig. The coefficient of friction for large block and small block with floor are 0.25 and 0.35 respectively. Determine the tension in the cord.

05

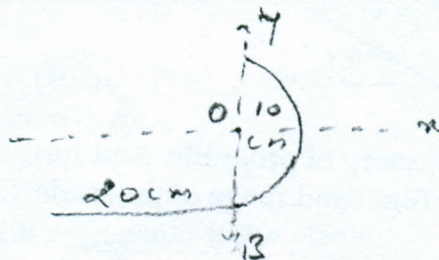


Q.5A The equation of motion of a car is given by the expression $S=20t+2t^2-t^3$ where S in meters and t is in seconds. Determine the (i) the velocity and acceleration from the start (ii) the maximum velocity and time at which maximum velocity occurs (iii) displacement, velocity and acceleration at the end of 5 sec.

05

Q.5B Determine the centroid of the given fig with respect to point 0.

05



Q.6A An effort of 200N is required just to move a certain body up an inclined plane of an angle 15° the force acting parallel to the plane. If the angle of inclination of the plane is made 20° , the effort required again applied parallel to the plane is found to be 230N. Find the weight of body and coefficient of friction.

05

Q.6B Derive the expression for the Efficiency, MA, VR for the Weston Differential pulley block.

05

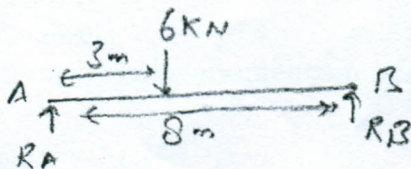
OR

Q.6B Determine the moment of inertia of a triangle. About base axis and axis parallel to base and passing through centroid.

05

Q.7A 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.

05



Q.7B A ball is dropped on a smooth horizontal floor from a height H . and after bounce it attains a height of 11.2m and after successive forth bounce it attains a height of 2.9m Determine the coefficient of restitution and magnitude of H .

05

OR

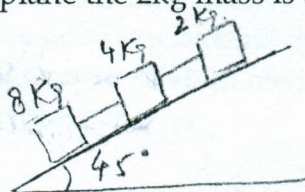
Q.7B Prove that two perfect elastic bodies of equal masses exchange velocities in the case of direct impact.

05

- Q.8A A bullet of weight 1.3gm enters a wooden block at a velocity of 972m/s and comes to rest within 0.002 seconds after entering the block. Determine the average impulsive force acting on the bullet and the length of penetration. 5+5

And derive the maximum efficiency of screw jack.

- Q.9A Three masses 8kg, 4kg, and 2kg are connected by a flexible extensible cord rest on a smooth plane inclined 45° with horizontal as shown in fig. when the masses are released, what will be the tensions in the cords? Assume the coefficient between the plane and the 8kg mass is 0.2, between plane and the 4kg mass is 0.4 and between plane the 2kg mass is 0.6. 10



- Q.9B Derive the equation of trajectory of projectile. And further get the relation for maximum height, time of flight and range of projectile. (With neat diagram) 10

OR

- Q.9B Define fixed vector and free vector, concurrent and non concurrent forces, 10

Determine the magnitude and direction of the equilibrant.

