

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination (special), Jan- 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. A body will begin to move down an inclined plane of the angle of inclination of the plane is..... than the angle of friction.
2. A set of forces whose resultant is zero is known as the set of
 - (a) collinear forces
 - (b) coplanar forces
 - (c) concurrent forces
 - (d) equilibrium
3. If a body is projected upwards, then at the highest point the final velocity is
 - (a) zero
 - (b) maximum
 - (c) equal to 9.81
 - (d) all the above
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. 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
6. 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
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. Vector $A = 5i + 3j + 4k$, $B = -2i + 2j + 2k$ then $A \times B = \dots\dots\dots$
9. The coefficient of restitution for elastic bodies is
 - (a) one
 - (b) between zero and one
 - (c) zero

(d) none of the above.

10. The moment of inertia of a triangle of base b and height h about the base will be
(a) $bh^3/36$ (b) $bh^3/12$ (c) $hb^3/36$ (d) $hb^3/12$

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

10

State perpendicular axis theorem

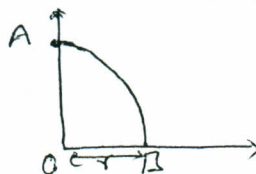
Define the term coefficient of restitution

Angle of repose

Law of friction

- Q.3A Determine, by integration, the coordinates x_c and y_c of the centroid C of the Quadrant AB of the arc of the circle of radius r .

05

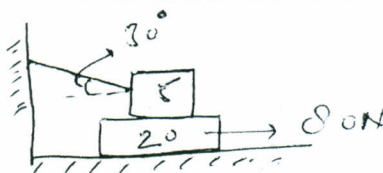


- Q.3B State and prove Lami's theorem.

05

- Q.4A A system consisting of a large block of mass 20N 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 0.2 and 0.3 respectively. Determine the tension in the cord.

05



- Q.4B A block of weight $W_1=300\text{N}$ rests on a horizontal surface and supports on top of it another block of weight $W_2=200\text{N}$. The block W_2 is attached with vertical wall by the string AB. 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 0.1

05

- Q.5A The equation of motion of a car is given by the expression $S=20t+2t^2-t^3$ where S is 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 4 sec.

05

- Q.5B Calculate the length of cross belt drive with diagram.

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.

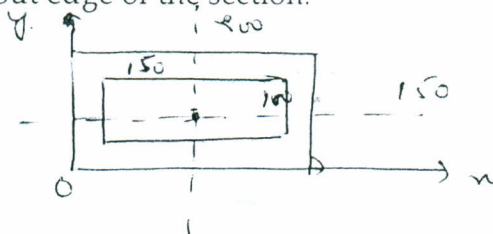
05

- Q.6B Derive the expression for the Efficiency, MA , VR for the third system of pulley.

05

OR

- Q.6B Determine the second moment of the hollow rectangular sectional area (i) about centroidal axes (ii) about edge of the section. 05



- Q.7A Prove that two perfect elastic bodies of equal masses exchange velocities in the case of direct impact. 05

- Q.7B Determine the moment of inertia of a rod of length L and mass M about the line passing the middle point of rod. 05

OR

- Q.7B The simply supported beam AB carries a point load of 10KN at a distance of 5m from A. the span of beam is 8m. Using the principle of virtual work, find the reactions. 05

- Q.8A And derive the maximum efficiency of screw jack. 5+5

A bullet of weight 1.5gm enters a wooden block at a velocity of 972m/s and comes to rest within 0.003seconds after entering the block. Determine the average impulsive force acting on the bullet and the length of penetration.

- Q.9A 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

- Q.9B Define fixed vector and free vector, concurrent and non concurrent forces. 4+6
Forces 10KN, 40KN, 70KN and 80KN are concurrent at $O(1,2,3)$ and directed through $M(6,3,-2)$, $N(-4,-2,5)$, $P(3,2,4)$ and $Q(4,-3,6)$ respectively. Determine the resultant of the system.

OR

- Q.9B A ball of mass m starts at point M of the parabolic curve MCP defined as: 10

$$y = \left(\frac{4A}{l^2} \right) x^2$$

Where maximum depression of curved path with respect to horizontal is Δ as shown in fig. Determine the reaction at trough C.

