

JK LAKSHMIPAT UNIVERSITY, JAIPUR

INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination ^{R/Bach} November-December 2015

B. Tech/ CHE/CE/ME Semester I

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. In collision of two bodies in absence of other force field
 - (a) collision must be central
 - (b) collision must be direct
 - (c) total kinetic energy of bodies must be preserved
 - (d) total momentum must be preserved
2. In inelastic collision a part of the kinetic energy of the colliding bodies is converted into
 - (a) internal energy in at least one body
 - (b) runner power of a turbine
 - (c) potential energy in at least one body
 - (d) none of these
3. 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
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. 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) $hb^3/3$
6. The unit of coefficient of static friction is
 - (a) mm
 - (b) pure number
 - (c) second
 - (d) meter
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. Centrifugal force is
 - (a) real force
 - (b) not an inertial force
 - (c) fictitious force
 - (d) none of these

9. Relative velocity can be said as
10. Coefficient of restitution can be said as

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

10

Virtual work

Explain parallel axis theorem

Explain the law of friction

Angle of Friction

Q.3A Calculate the length of open belt drive with diagram.

05

Q.3B State and prove Lami's theorem

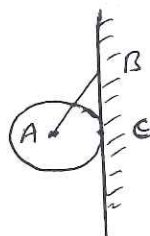
05

Q.4A Derive the expression VR and efficiency for Weston differential pulley block

05

Q.4B A ball is supported on a smooth wall by tying a rod, as shown in fig. Find the tension in the tie rod and support of the wall. Take radius of ball 5cm, length of the rod 13cm and weight 120N.

05

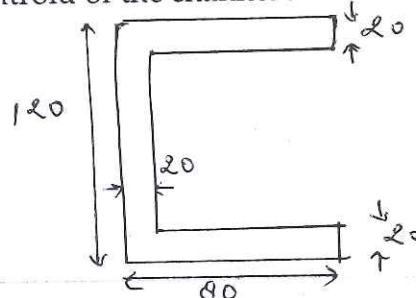


Q.5A The acceleration of particle along a straight line is given by the equation $a = 4 - t^2/9$. If the particle starts with zero velocity from a position $x=0$ find (i) its velocity after 6sec (ii) distance travelled in 6sec.

05

Q.5B Determine the centroid of the channel section shown in figure.

05

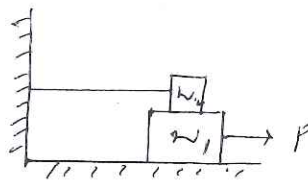


Q.6A The simply supported beam AB carries a point load of 6kN at a distance of 3m from A. the span of beam is 8m. Using the principle of virtual work, find the reactions.

05

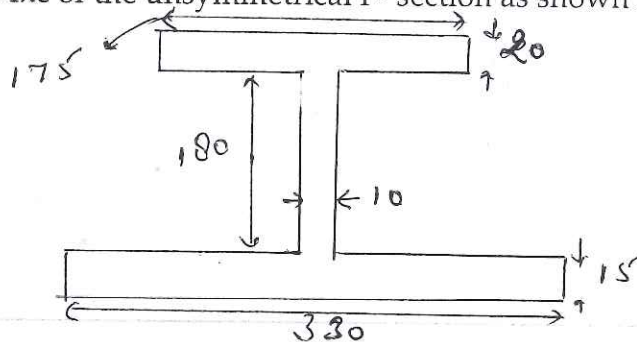
Q.6B A block of weight $W_1 = 200\text{kg}$ rests on a horizontal surface and supports on top of it another block of weight $W_2 = 50\text{n}$. The block W_2 attached with vertical wall by the string AB, shown in fig. Find the amount of the horizontal force P, applied to the lower block necessary for impending slipping. The coefficient of friction for all contiguous surface is 0.3

05



OR

Q.6B Determine I_{xc} of the unsymmetrical I - section as shown in fig. 05



Q.7A 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

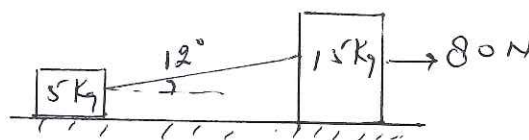
Q.7B Prove that two perfect elastic bodies of equal masses exchange velocities in the case of direct impact. 05

OR

Q.7B A ball of mass M starts sliding from position A, at a height H from the datum. Determine the expression of velocity V_B using the principle of energy and prove that this is invariant to mass of the body. 05

Q.8A Explain the term free vector, unit vector.
Forces 30KN, 40KN, 50KN and 60KN 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. 3+7

Q.9A A system consisting of a large block of mass 15kg and a small block of mass 5kg connected with an inclined cord 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. 10



Q.9B Derive the expression for time of flight, maximum height and maximum range for projectile motion on inclined plane. (with neat and clean 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