

INDIAN MARITIME UNIVERSITY
(A Central University, Government of India)
End Semester Examination Dec 2019/Jan 2020
B.Tech (Marine Engineering)
Semester -I
UG11T1105/2105- Engineering Mechanics-I

Date: 19.12.2019
Time: 3 Hours

Max Marks: 70
Pass Marks: 35

Part – A (compulsory)

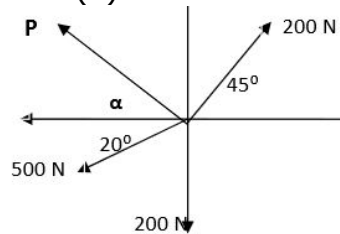
Answer the following (10x2=20 Marks)

1. What do you understand by the term equilibrant of a force system?
2. State the principle of Transmissibility.
3. Define engineering structure. How engineering structures are categorized?
4. Write the expression for Centre of Gravity and area Moment of Inertia of a hollow circular cross section has an outer diameter - D_2 , Inner diameter - D_1 .
5. Define perpendicular axis theorem.
6. How motions are classified?
7. What is general plane motion? Give examples.
8. A car starts from rest with a constant acceleration of 4m/s^2 . Find the distance travelled in the 7th second.
9. A force (P) is acting on a body at an angle of (θ). But the body does not move in the direction of the force. What is the work done by the force P? write the unit of work done.
10. What are the types of engine powers? Find the power of an engine, which can do a work of 1200J in 8 sec.

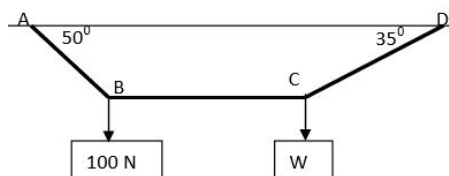
Part – B

Answer any 5 out of 7 questions (5 x 10= 50 marks)

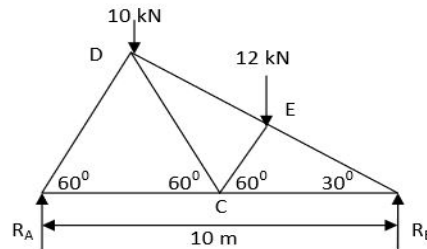
11. (a) The four coplanar forces are acting at a point as shown in the figure. The (p) force is unknown. The resultant all the forces is 500 N and acting along X axis. Find out the unknown force (P) and its inclination (α) with X axis. (5marks)



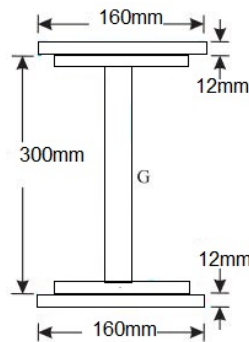
- (b) A string ABCD is fixed at A and D. The string is divided in to three portions such as AB, BC and CD are joined as shown in the figure. A weight 100 N is attached at B and the unknown weight 'W' is attached at C. Determine the weight 'W' at the point C to maintain the portion BC in horizontal position. (5marks)



12. A horizontal link AB is a span of 10m, divided into two parts AC, and CB above each, a triangle is drawn. The apices E, and D of the triangles on AC, BC respectively are also jointed. The figure is then represented by a framework simply at its ends A and B. The vertical loads 10kN, 12kN are carried at D and E as shown in Figure. Find the nature and magnitude of forces in each of the jointed member. (10 marks)



13. What are the methods accustomed to analyze Trusses? Explain the procedure is used to find the forces in various members truss by method of joints. (10 marks)
14. (a) The initial angular velocity of a rotating body is 2 rad / sec. and initial angular acceleration is zero. The rotation of the body is according to the relation $\alpha = 3t^2 - 3$. Determine
 (i) Angular velocity and (ii) angular displacement when $t = 5$ sec. (5marks)
- (b) A train starts from rest and moves along a curved track of radius 800 m with uniform acceleration until it attains a velocity of 72 kmph at the end of 3 minute. Determine the tangential, normal and total acceleration in m/s^2 of the train at the end of second minute. (5marks)
15. A compound beam is made by welding two steel plates 160 mm \times 12 mm one on each flange of an ISLB 300 section as shown in figure. Find the moment of inertia the beam section about an axis passing through its centre of gravity and parallel to X-X axis. Take moment of inertia of the ISLB 300 section about X-X axis as $73.329 \times 10^6 \text{ mm}^4$. (10marks)



16. What load will be lifted by an effort of 12 N, if the velocity ratio is 18 and efficiency of the machine at this load is 60 %? If the machine has a constant friction resistance, determine the law of the machine and find the effort required to run this machine at (i) No load, and (ii) a load of 900 N. (10 marks)
- 17 (a) A body is projected upwards with a velocity of 50 m/s at angle of 50° with the horizontal. What will be its (i) velocity and (ii) direction at a height of 30 m from the point of projection? (5 marks)
- (b) A ball is projected from a point with a velocity of 10 m/s on an inclined plane. the angle of projection and inclination of the plane are 35° and 15° respectively with the horizontal. Find the time of flight of the ball, when it is projected upwards and downwards the plane. (5 marks)