Reg. No. : | | | | | | | | | | | | |

# Question Paper Code : 21843

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2015.

Second Semester

Civil Engineering

ME 2151/ME 25/080120002/CE 1151/10122 ME 205 — ENGINEERING MECHANICS

(Common to Aeronautical, Automobile, Marine, Mechanical, Production, Chemical, Petroleum Engineering, Biotechnology, Polymer, Textile, Textile (Fashion), Plastic Technology, Materials Science and Engineering, Manufacturing Engineering, Mechatronics Engineering, Industrial Engineering, Industrial Engineering and Management, Environmental Engineering, Geoinformatics, Mechanical and Automation Engineering, Petrochemical Engineering, Chemical and Electrochemical Engineering, Petrochemical Technology, Pharmaceutical Technology, Textile Chemistry and Mechanical Engineering (Sandwich))

(Regulations 2008/2010)

(Common to 10122 ME 205 — Engineering Mechanics for BE. (Part-Time) First Semester — Mechanical Engineering — Regulations 2010)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Parallelogram law of forces.
2. State the conditions for a particle to be in equilibrium in space.
3. Sketch the 'roller' and 'hinge' supports showing the reaction components.
4. For the fig: 1 shown find the moment of forces at point 'a'.

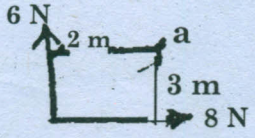


Fig. 1

5. For the 'T' section shown in Fig. 2 find the centroid.

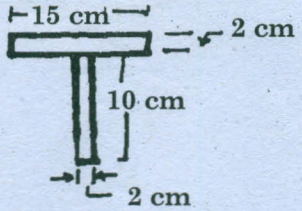


Fig. 2

6. State the parallel axis theorem.

7. For the system shown in Fig. 3 find the work done by the force in moving the object by 2 m.

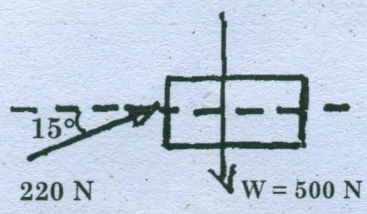


Fig. 3

8. A body is moving with a velocity of 5 m/s. After 3 seconds the velocity is 8 m/s. Find the acceleration.

9. Define 'Cone of friction'.

10. What is general plane of motion? Give an example.

PART B — ($5 \times 16 = 80$ marks)

11. (a) Five forces $4, \sqrt{3}, 5, \sqrt{3}$ and 3 kN respectively act at one of the angular points of a regular hexagon towards other five angular points. Find the magnitude and direction of the resultant and equilibrant of forces.

Or

(b) A force $p = 911N$ is directed from a point $A(4,1,4)$ metres towards a point $B(-3,4,1)$ metres. Determine the force vector P.

12. (a) A roller of radius 40 cm weighing 3000 N is to be pulled over a rectangular block of height 20 cm as shown in fig. 4 by a horizontal force applied at the end of a string wound round the circumference of the roller. Find the magnitude of the horizontal force which will just turn the roller over the corner of the block. Also determine the magnitude and direction of reaction at A and B. Assume all surfaces are smooth.

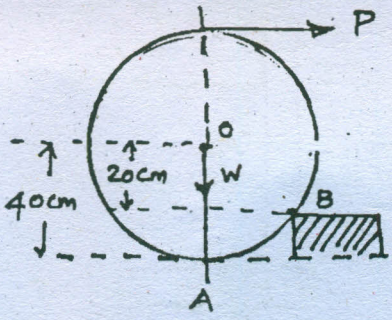


Fig. 4

Or

(b) (i) State and prove Varignon's theorem. (6)

(ii) Find the magnitude and direction of a single force P which keeps the system shown in Fig. 5 in equilibrium (The position of the force from the point A) (10)

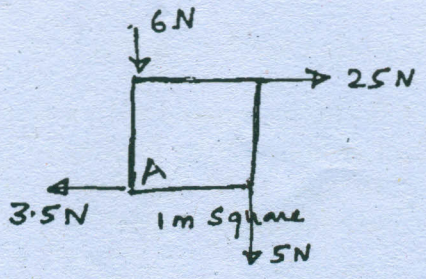


Fig. 5

13. (a) For the plane uniform lamina shown in Fig. 6. Find the centroid.

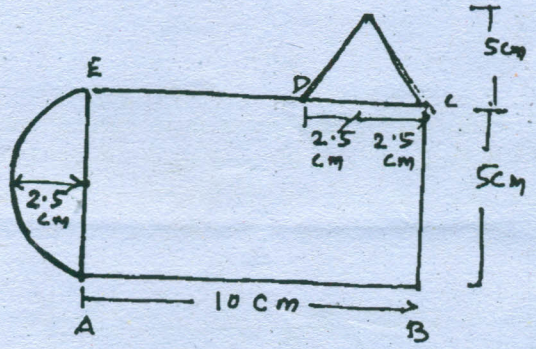


Fig. 6

Or

(b) For the angle section shown in Fig. 7. Find the moment of Inertia about its horizontal centroidal axes.

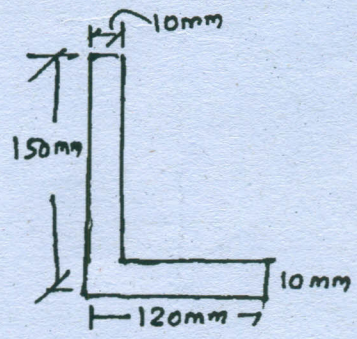


Fig. 7

14. (a) (i) A body is moving with uniform acceleration and covers 15 m in fifth second and 25 m in 10th second. Determine the initial velocity and acceleration of the body. (10)

(ii) State Newton's first law, second law and law of Transmissibility. (6)

Or

(b) (i) Derive the work, energy equation. (6)

(ii) A ball of mass 20 kg moving with a velocity of 5 m/s strikes directly another ball of mass 10 kg moving in the opposite direction with a velocity of 10 m/s. If the coefficient of restitution is 5/6, find the velocity of each ball after impact. (10)

15. (a) An open-belt drive connects two pulleys 120 cm and 50 cm diameters on parallel shafts 4 m apart. The maximum tension in the belt is 1855 N. The coefficient of friction is 0.30. The driver pulley of diameter 120 cm runs at 200 rpm. Calculate the power transmitted and torque on each of the two shafts.

Or

(b) A cylindrical roller 50 cm diameter is in contact with two conveyor belts at its top and bottom as shown in Fig. 8. If the belts run at the uniform speed of 5 m/s and 3 m/s. Find the linear velocity and angular velocity of the roller.

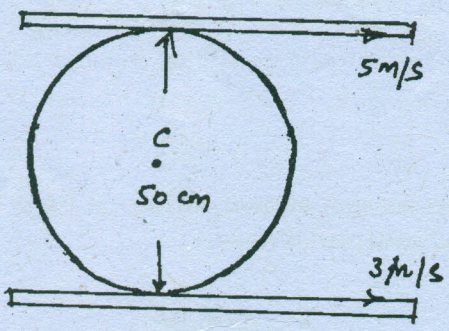


Fig. 8