(b) Two blocks 'A' and 'B' of masses m_A = 280 kg and m_B = 420 kg are joined by an inextensible cable as shown in Fig. 4(b). Assume that the pulley is frictionless and μ = 0.30 between block 'A' and the surface. The system is initially at rest. Determine (i) acceleration of block A: (ii) velocity after it has moved 3.5 m; and (iii) velocity after 1.5 seconds.

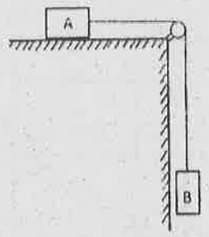

Fig. 14 (b)

15. (a) A 100 N force acts on a 300N block placed on an inclined plane as shown in Fig. 15(a). The coefficients of friction between the block and the plane are μ_s = 0.25 and μ_k = 0.20. Determine whether the block is in equilibrium, and find the value of the friction force.

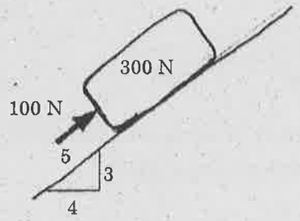

Fig. 15 (a)

Or

(b) A wheel is attached to the shaft of an electric motor of rated speed of 2000 rpm. When the power is switched on, the wheel attains the rated speed in 10 seconds and when the power is switched off, the unit comes to rest in 100 seconds. Assume uniformly accelerated motion and determine the number of revolutions the unit turns (i) to attain the rated speed and (ii) to come to rest.

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26/05/2017 FN

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

Question Paper Code : 71945

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2017.

Second Semester

Civil Engineering

GE 6253 – ENGINEERING MECHANICS

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

(Regulations 2013)

Time : Three hours , Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State the principle of transmissibility.
2. Find the resultant and direction of Force $\vec{F} = 3i - 4j$.
3. Differentiate between moment and couple.
4. A uniform ladder of weight 'W' leans against a vertical wall. Assuming the contact surfaces as rough, draw the free body diagram of the ladder with necessary assumptions.
5. Differentiate between center of gravity and centroid.
6. State parallel axis theorem as applied to area Moment of Inertia.
7. The displacement of a particle is given by $S = 3t^2 + 2t$ meters. Where 't' is in seconds? Find the velocity and acceleration when t = 10 seconds.
8. State the principle of work-energy.

9. What is dry friction?

10. What is general plane motion? Give one example.

PART B — (5 × 16 = 80 marks)

11. (a) Two cylinders C, F of diameter 60mm and 30mm. weighing 160 N and 40 N respectively are placed as shown in Fig. 11(a). Assuming all the contact surfaces to be smooth, find the reactions at A, B and C.

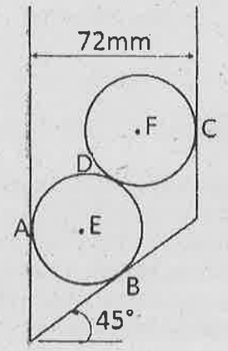

Fig. 11(a)

Or

(b) Forces 32 kN, 24 kN, 24 kN and 120 kN are concurrent at origin (0,0,0) and are respectively directed through the points whose coordinates are A(2, 1, 6). B(4, –2, 5), C(–3, –2, 1) and D(5, 1, –2). Determine resultant of the system.

12. (a) Four tug boats are used to bring a large ship to its pier. Each tug boat exerts a 5000N force in the direction as shown in Fig. 12(a). Determine the equivalent force-couple system at point 'O', and the point on hull where a single more powerful tugboat should push to produce the same effect as the original four tugboats.

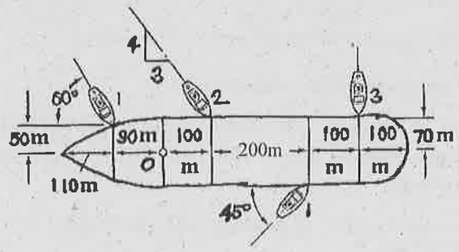

Fig. 12(a)

Or

(b) A light bar AD is suspended from a cable BE and supports a 50 kg block at C as shown in Fig. 12(b). The ends A and D of the bar are in contact with frictionless vertical walls. Determine the tension in cable BE and the reactions at A and D.

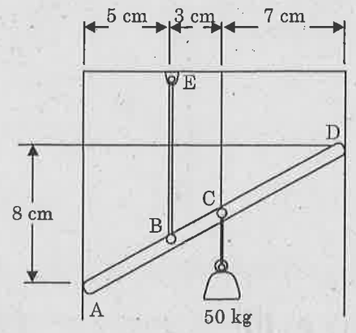

Fig. 12(b)

13. (a) Determine the location of centroid for the right angle triangle from the first principles and find the volume of cone using Pappus-Guldinus theorem.

Or

(b) Calculate the moment of inertia of the section shown in Fig. 13(b) about "x" and "y" axes through the centroid.

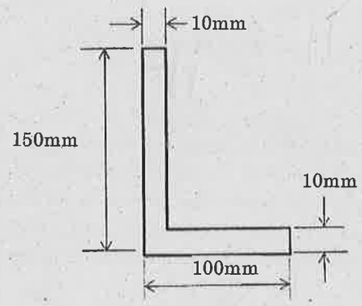

Fig. 13(b)

14. (a) A body moving with uniform acceleration is observed to travel 33 m in 8th second and 53 m in 13th second of its travel. Calculate the velocity at start and uniform acceleration.

Or