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EGS-124

B.E. 1st Sem. (CGPA) Mech. Engg. (Zero Sem.),

Examination-2019

ENGG MECHANICS

Paper-M-104

Time : 3 hours]

[Maximum marks : 60

Note : All questions carry equal marks. Assume suitable data wherever needed.

Unit-I

1. (a) State and prove Varignon's theorem. 5
- (b) A horizontal line PQRS is 12 m long, where $PQ=QR=RS=4$ m. Forces of 1000 N, 1500 N, 1000 N and 500 N act at P, Q, R and S respectively with downward direction. The lines of action of these forces make angles of 90° , 60° , 45° and 30° respectively with PS. Find the magnitude, direction and position of the resultant force. 7
- or
- (c) A smooth circular cylinder of radius 1.5 meter is lying in a triangular groove, one side of which makes 15° angle and the other 40° angle with the horizontal. Find the reactions at the surfaces of contact, if there is no friction and the cylinder weights 100 N. 7

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(1)

Turn Over

Unit-II

2. (a) Differentiate between Centre of gravity and Centroid. 5

(b) Find the moment of inertia of a rectangular section 60 mm wide and 40 mm deep about its Centre of gravity. 7

or

(c) Find the moment of inertia of a T-section with flange as 150mm \times 50mm and web as 150mm \times 50mm about X-X and Y-Y axes through the centre of gravity of the section. 7

Unit-III

3. (a) State the laws of friction. 5

(b) A body, resting on a rough horizontal plane, required a pull of 180 N inclined at 30° to the plane just to move it. It was found that a push of 220 N inclined at 30° to the plane just moved the body. Determine the weight of the body and the coefficient of friction. 7

or

(c) A laminated belt 8 mm thick and 150 mm wide drives a pulley of 1.2 m diameter at 180 r.p.m. The angle of lap is 190° and mass of the belt material is 1000 kg/m³. If the stress in the belt is not to exceed 1.5 N/mm² and the coefficient of friction between the belt and the pulley is 0.3, determine the power transmitted when the centrifugal tension is (i) considered, and (ii) neglected. 7

Unit-IV

4. (a) Explain D'Alembert's principle. 5
- (b) An elevator of mass 2 t is to be lifted and lowered by means of a rope. Find the tension in the rope, when the elevator is moving (i) upward with an acceleration of 2 m/s^2 and (ii) downward with an acceleration of 1.5 m/s^2 . 7

or

- (c) A train of mass 200 tonnes moves on a level track having a track resistance of 85 Newton's per tonne. Find the maximum speed of the engine, when the power developed is 320 kW. 7

Unit-V

5. (a) What is relationship between load, shear force and bending moment? 5
- (b) A simply supported beam is carrying a uniformly distributed load of 2 kN/m over a length of 3 m from the right end. The length of the beam is 6 m. Draw the S.F. and B.M. diagram for the beam and also calculate the maximum B.M. on the section. 7

or

- (c) Draw shear force and bending moment diagrams for a simply supported beam carrying a uniformly distributed load. 7