I Mid Term examination
Session: 2018-19
B.Tech II Year (III Semester) Mechanical Engineering
Engineering Mechanics (3ME3-04)
SET-A

Time: 2 hrs.   M.M.:20

Instruction for students:

1. No provision for supplementary answer book.
2. Question paper contains three sections. Sec A includes 5 Short answers type questions (upto 25 words) Sec B- contains 06 Questions out of which any 04 questions to be attempt by the student (Analytical/Problem solving questions.).Sec C- contains 03 Questions out of which any 02 questions to be attempt by the student (Descriptive /Design questions.)

Sec-A   (5*1=5 Marks)

Q.1 State the law of Parallelogram of forces with neat sketch.

Q.2 State the Lami's Theorem with neat sketch

Q.3 State the Theorem of Parallel axis

Q.4 Differentiate between Angle of Friction and coefficient of friction

Q.5 Define velocity ratio of lifting Machine

Sec-B(4*2=8 Marks)

Q.1 Four forces equal to P, 2P, 3P and 4P are respectively acting along the four sides of square ABCD taken in order. Find the magnitude, direction and position of the resultant force.
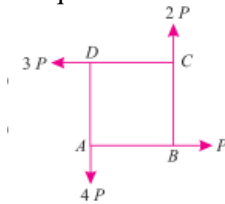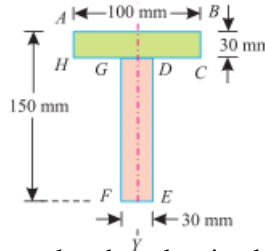
Q.2 Find the centre of gravity of a 100 mm × 150 mm × 30 mm T-section.

Q.3 Enlist the the laws of static friction

Q.4 Explain Differential wheel and axle with neat sketch and write down its Velocity ratio.

Q.5 Describe Second system of pulleys (having six Pulley)with neat sketch.

Q.6 In a certain weight lifting machine, a weight of 1 kN is lifted by an effort of 25 N. While the weight moves up by 100 mm, the point of application of effort moves by 8 m.Find mechanical advantage, velocity ratio and efficiency of the machine.

Sec-C(2*3.5=7 Marks)

Q.1 A particle is acted upon by the following forces.

(i) 20 N inclined at 30° towards North of East,(ii) 25 N towards North,(iii) 30 N towards North West, and(iv) 35 N inclined at 40° towards South of West.Find the magnitude and direction of the resultant force.

Q.2 Derive the Moment of Inertia of a rectangular section is $\dfrac{bd^3}{12}$

Q.3 A uniform ladder of length 3.25 m and weighing 250 N is placed against a smooth vertical wall with its lower end 1.25 m from the wall. The coefficient of friction between the ladder and floor is 0.3.What is the frictional force acting on the ladder at the point of contact between the ladder andthe floor? Show that the ladder will remain in equilibrium in this position

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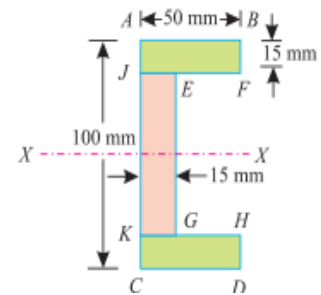**Sec-A**   (5*1=5 Marks)

Q.1 State the polygon law of forces with neat sketch.

Q.2 State the Lami's Theorem with neat sketch
Q.3 State the theorem of Perpendicular Axis
Q.4 State the Varignon's principle of moments or law of moment
Q.5 State the Law of Machine

Sec-B(4*2=8 Marks)

Q.1 State and prove the law of Parallelogram of forces with neat sketch.
Q.2 Find the centre of gravity of a channel section 100 mm × 50 mm × 15 mm.

Q.3 In a certain weight lifting machine, a weight of 1 kN is lifted by an effort of 25 N. While the weight moves up by 100 mm, the point of application of effort moves by 8 m.Find mechanical advantage, velocity ratio and efficiency of the machine.
Q.4 Enlist the the laws of Dynamic friction
Q.5 Explain Single purchase crab winch with neat sketch and write down its Velocity ratio.
Q.6 Find the length of belt(in open system)necessary to drive a pulley of 500 mm diameter running parallel at a distance of 12 meters from the driving pulley of diameter 1600 mm.

Sec-C(2*3.5=7 Marks)

Q.1 An electric light fixture weighting 15 N hangs from a point C, by two strings AC and BC. The string AC is inclined at 60° to the horizontal and BC at 45° to the horizontal Using Lami's theorem, determine the forces in the strings AC and BC
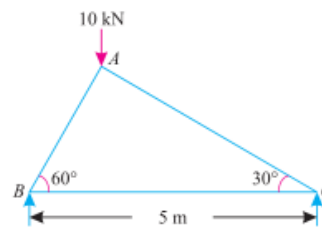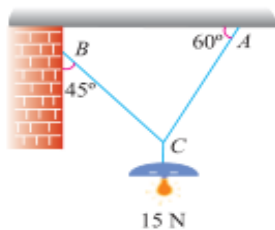
Q.2 The truss ABC has a span of 5 metres. It is carrying aload of 10 kN at its apex. Find the forces in the members AB, AC and BC
Q.3 Drive the Moment of Inertia of a circular section if $\frac{\pi}{64}(d)^4$