Code No: R19ES1204

**R19**

SET - 1

**I B. Tech II Semester Supplementary Examinations, July/August - 2021**
**ENGINEERING MECHANICS**
**(**Com. to ME, Chem. E, Pet E, Agri E**)**

Time: 3 hours Max. Marks: 75

**Answer any five Questions one Question from Each Unit**
**All Questions Carry Equal Marks**

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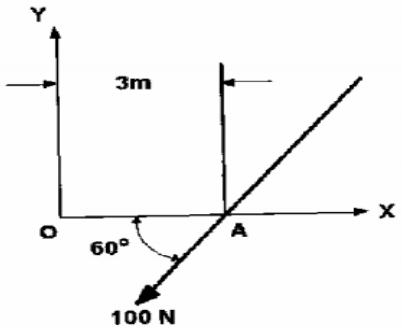
1. a) A Horizontal line PQRS is 12 m long, where PQ = QR = RS = 4m. Forces of 1000, 1500, 1000 and 500N act at P, Q, R and S respectively and line of action of these forces make angles of $90^0$, $60^0$, $45^0$ and $30^0$ respectively with PS. Find the magnitude, direction and position of the resultant force? (8M)

   b) A force of 100 N is acting at a point A as shown in figure. Determine the moments of this force about 0.E (7M)



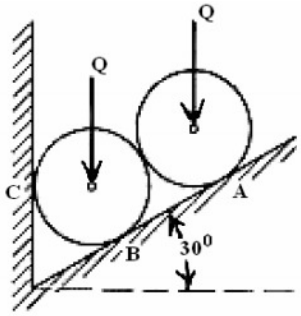

Figure

Or

2. Forces $P_1$, $P_2$, $P_3$ and $P_4$ of magnitudes 10 kN, 20kN, 25 kN and 40 kN are concurrent in space and are directed through the points A (3, 2,5), B (1, 7, 4), C (4, -2, 4) and D(-2, 4, -3) respectively. Determine the resultant of the system of forces. Given the system forces are concurrent at the origin. (15M)

3. a) Define and explain free body diagram and resultant of a force. (5M)

   b) Two identical rollers, each of weight 100 N, are supported by an inclined plane and a vertical wall as shown in figure. Assuming smooth surfaces, find the reactions induced at the points of support A, B and C. (10M)




Figure

Or

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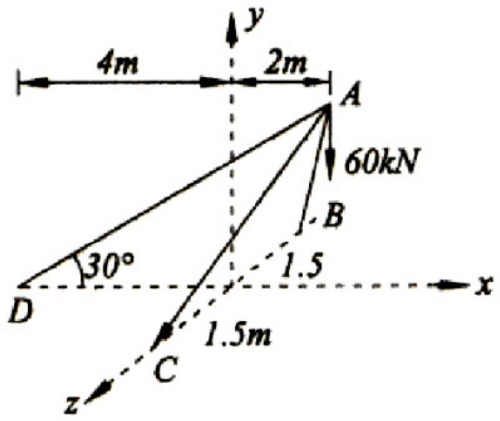
Code No: R19ES1204 **R19** SET - 1

4. a) Write about Lamis theorem. (3M)

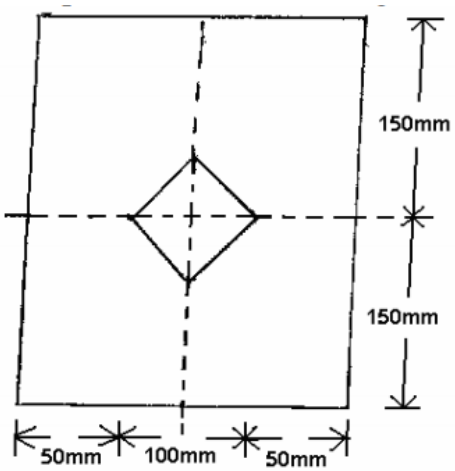
   b) A load of 60kN is to be resisted by means of a shear leg arrangement as shown in figure. Determine forces in legs AB, AC and rope AD. (12M)




Figure

5. a) Explain about mass moment of inertia of composite bodies. (5M)

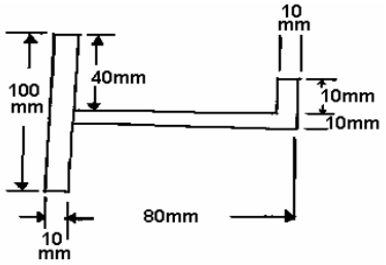
   b) Locate the centroid of the shaded area shown in figure. (10M)




Figure

Or

6. a) Compute the moment of inertia of the plane area shown in figure about its horizontal centroidal axis. (9M)




Figure

b) Define and explain polar moment of inertia and transfer theorem. (6M)

7. a) A particle is projected with a velocity of 10m/s at an angle of elevation of 60° . Find (7M)
(i) The equation of the path of motion.
(ii) The length of latus rectum of the path of motion
(iii) Time required to cover the range.
(iv) The length of range.

b) An electric train which starts from one station is uniformly accelerated for the first 10 seconds, during which period it covers 150 metres. It then runs with constant speed until it is finally retarded uniformly in the last 40 metres. Calculate the maximum speed and the time taken over the journey to the next stopping station which is 600m from the previous station. (8M)

Or

8. a) An airplane is flying horizontally with a velocity of 450km/hr at an altitude of 1960m towards a target on the ground which is to be bombed. Estimate where the bomb must be released in order to hit the target and the time of travel of the bomb. What is the velocity with which the bomb will hit the target? Also find the angle made by the line of sight of the pilot when the bomb is released. (10M)

b) Differentiate between rectilinear and curvilinear motion? (5M)

9. A 2000 Kg Automobile is driven down a $5^0$ incline at a speed of 90 km/h. When the brakes are applied causing a constant total braking force of 7.5 KN. Determine the distance travelled by Automobile as it comes to stop. Use work-energy method. (15M)

Or

10. a) Two rigid bodies of weights $W_1$ and $W_2$ are connected by an inextensible string and pulled by a force P. The paths of motion of the bodies are at an angle $\theta$ to each other. Derive the work energy equation for the system? (10M)

b) Explain the significance and applications of kinematics and kinetics of translation. (5M)