Q. Code:597037

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

B.E./ B.TECH. DEGREE EXAMINATIONS, MAY 2024

Second -Semester

AE18201 – APPLIED MECHANICS

(Automobile Engineering)

(Regulation2018/ 2018A)

TIME:3 HOURS **MAX. MARKS: 100**

COURSE OUTCOMES	STATEMENT	RBT LEVEL
CO 1	Explain the different principles applied to solve engineering problems dealing with force, displacement, velocity and acceleration.	**4**
CO 2	Analyze the frictional forces acting on a system and examine the velocity and acceleration inducing on a body with rectilinear and curvilinear motions.	**4**
CO 3	Identify and analyze the application of friction force on various belt drives.	**4**
CO 4	Identify and examine the centroid, center of gravity, area moment of inertia and mass moment of inertia	**4**
CO 5	Investigate the dynamic forces subjected to a rigid body.	**4**

PART- A(10x2=20Marks)

(Answer all Questions)

		CO	RBT LEVEL
1.	Determine the projection of the force F = 10i – 8j + 14k N on the directed line L which originates at point (2, -5, 3) and passes through point (5, 2, -4).	**1**	**3**
2.	State the necessary and sufficient conditions for static equilibrium of a particle in two dimensions.	**1**	**2**
3.	State Coloumb's laws of Friction.	**2**	**2**
4.	Kannan runs at a speed of 10m/s along a straight line from A to B and returns along BA from B to A at constant speed of 5 m/s. Determine (i) The average speed over the entire trip (ii) The average velocity over the entire trip.	**2**	**3**
5.	Define slip of belt.	**3**	**2**
6.	It is required to drive a shaft at 620 revolutions per minute, by means of a belt from a parallel shaft, having a pulley A 300 mm diameter on it and running at 240 revolutions per minute. What sized pulley is required on the shaft B ?	**3**	**3**
7.	Define centroid and centre of gravity.	**4**	**2**
8.	Determine the area of the lateral surface of the frustum of a right circular cone of top diameter 400 mm, bottom diameter 150 mm and height 500 mm using Pappus-Guldinus theorem.	**4**	**3**
9.	State the Laws of Motion. How do the First Law and the Second Law relate to each other?	**5**	**2**
10.	Explain clearly the term 'recoil of gun'. How will you find the velocity of the bullet?	**5**	**2**

PART- B (5x 14=70Marks)

		Marks	CO	RBT LEVEL
11.(a)	Two spheres A and B weighing 100 N and 75 N respectively and with the corresponding radii 75 mm and 50 mm are placed in a container as shown in Figure 1. Determine the support reactions.	**(14)**	**1**	**4**

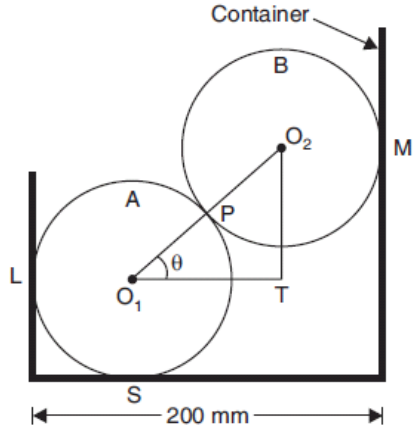

Figure 1

(OR)

(b)	Rod AB shown in Figure2 is subjected to the 200-N force. Determine the reactions at the ball-and-socket joint A and the tension in the cables BD and BE. The collar at C is fixed to the rod.	**(14)**	**1**	**4**

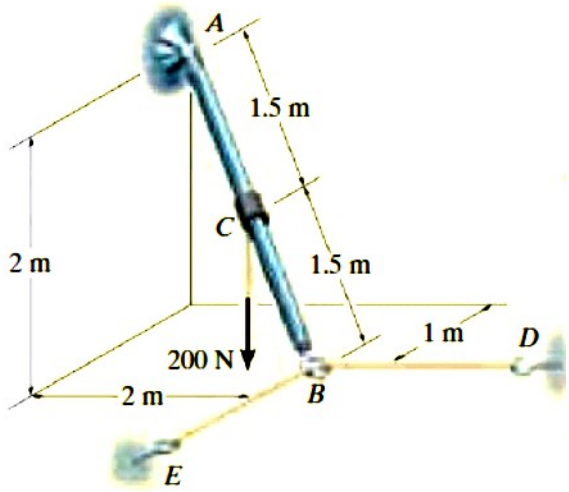

Figure 2

12.(a)	A block shown in figure 3, is overlying a 10° wedge on a horizontal floor and leaning against avertical wall and weighing 15 kN is to be raised by applying a horizontal force to the wedge. Assuming the co-efficient of friction between all the surfaces in contact to be 0.3, determine the minimum horizontal force, to be applied to raise the block.	**(14)**	**2**	**4**

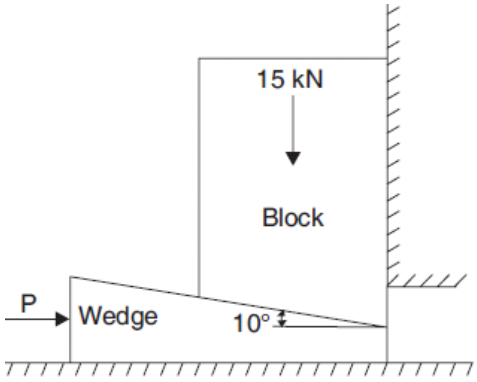

Figure 3

(OR)

(b)	Two stations A and B are 10 km apart in a straight track, and a train starts from A and comes to rest at B. For three quarters of the distance, the train is uniformly accelerated and for the remainder uniformly retarded. If it takes 15 minutes over the whole journey, find its acceleration, its retardation and the maximum speed it attains.	**(14)**	**2**	**4**
13.(a)	Obtain an expression for the length of a belt in an open belt drive.	**(14)**	**3**	**4**

(OR)

(b)	A flat belt is required to transmit 35 kW from a pulley of 1·5 m effective diameter running at 300 r.p.m. The angle of contact is spread over 11/24 of the circumference and coefficient of friction between the belt and pulley surface is 0·3. Taking centrifugal tension into account, determine the width of the belt. Take belt thickness as 9·5 mm, density as 1·1 Mg/m^3 and permissible stress as 2·5 N/mm^2	**(14)**	**3**	**4**
14.(a)	A uniform lamina shown in Figure 4 consists of a rectangle, a circle and a triangle. Determine the centroid of the lamina.	**(14)**	**4**	**4**

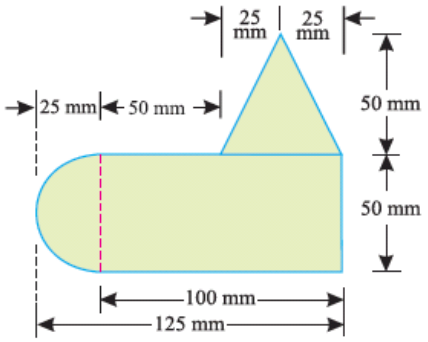

Figure 4

(OR)

(b)	Find the moment of inertia of a hollow section shown in Figure 5. about an axis passing through its centroid.	**(14)**	**4**	**4**

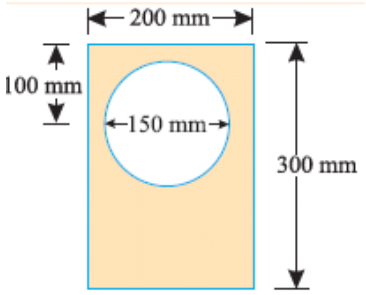

Figure 5

15.(a)	Two blocks of weight 750N and 1500N start from rest as shown. Find the acceleration of each block and the distance travelled by the 750N block in 2 sec. Also find the tension in the string. μ = 0.25.(Figure 6)	**(14)**	**5**	**4**

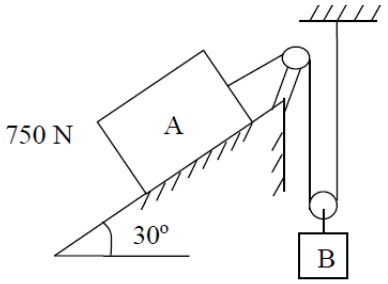

Figure 6

(OR)

(b)	A wheel of radius 1 m rolls freely with an angular velocity of 5rad/s and with an angular acceleration of 4 rad/s^2. Determine the velocity and acceleration of point B and D shown in the figure 7.	**(14)**	**5**	**4**

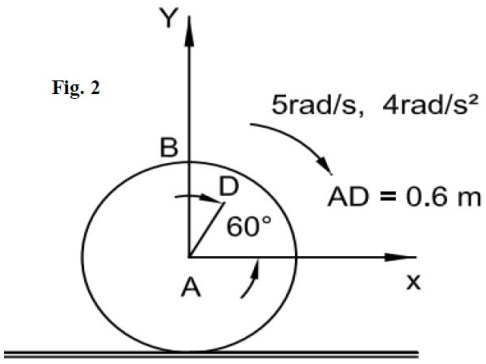

Figure 7

PART- C (1x 10=10Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16.	A particle is thrown with a velocity of 5 m/s at an elevation of 60° to the horizontal. Find the velocity of another particle thrown at an elevation of 45° which will have (a) equal horizontal range, (b) equal maximum height, and (c) equal time of flight.	**(10)**	**2**	**4**

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