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

B.E / B.TECH. DEGREE EXAMINATIONS, MAY 2023

Second Semester

AE18201 – APPLIED MECHANICS

(Automobile Engineering)

(Regulation 2018 & 2018A)

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

CO 1 Explain the different principles applied to solve engineering problems dealing with force.

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.

CO 3 Analyze the various belt transmission.

CO 4 Identify and examine the centroid, center of gravity, area moment of inertia and mass moment of inertia.

CO 5 Investigate the dynamic forces subjected to a rigid body.

PART- A (10 x 2 = 20 Marks)

(Answer all Questions)

		CO	RBT LEVEL
1	What is meant by free vector?	**1**	**1**
2	A force F= (8i-10j-2k) N is acting at a point A whose position vector from the origin of the coordinate axes is 10i+4j-3k. Find the moment of this force about the origin.	**1**	**2**
3	State coulomb's law of friction.	**2**	**2**
4	A scooter starts from rest and moves with a constant acceleration of 2.25 m/s^2. Determine its velocity, after it has travelled for 100 meters.	**2**	**2**
5	Find the necessary difference in tensions in N in the two sides of a belt drive, when transmitting a power of 0.120 kW at 20 m/sec.	**3**	**2**
6	Write an expression to determine the length of an open-end belt.	**3**	**1**
7	Distinguish between area moment of inertia and mass moment of inertia.	**4**	**2**
8	Write an expression for area moment of inertia through the centroid of a square plate of side 'a'.	**4**	**1**
9	State Impulse -Momentum principle.	**5**	**1**
10	State different forms of energy and distinguish between kinetic energy and potential energy.	**5**	**2**

PART- B (5 x 14 = 70 Marks)

		Marks	CO	RBT LEVEL
11(a)	A right circular roller of weight 5000 N rests on a smooth inclined plane	**(14)**	**1**	**3**

and is held in position by a chord A as shown in Fig.1. Find the tension in the chord and reaction at B, if there is a horizontal force P=1000 N acting at C.

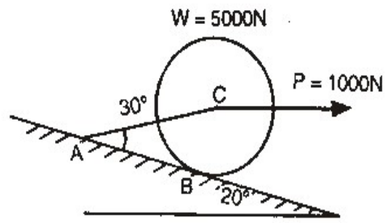

Fig. 1.

(OR)

11(b)	A rectangular plate is supported by three cables as shown in **Fig.2**. Knowing that the tension in cable *AC* is 20 N, determine the weight of the plate.	**(14)**	**1**	**3**

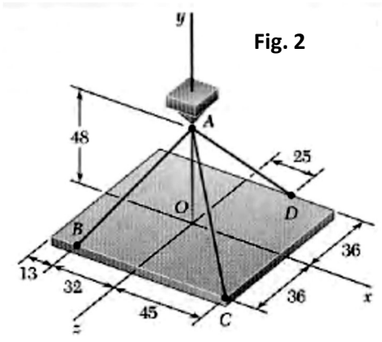

Fig. 2

12(a)	For the block and wedge shown in Fig.3, determine the value of 'p' required to raise the block.	**(14)**	**2**	**3**

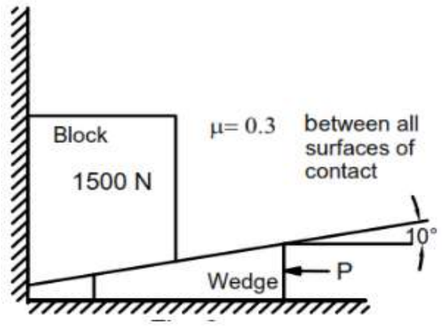

Fig 3

(OR)

12(b)	Two electric trains A and B leave the same station on parallel lines. The train A starts from rest with a uniform acceleration of 0.3 m/s^2 and attains	**(14)**	**2**	**3**

a speed of 60 kmph., which is maintained constant afterwards. The train B leaves 70 seconds after with a uniform acceleration of 0.6 m/s^2 to attain a maximum speed of 80 kmph., which is maintained constant afterwards. When will the train B overtake the train A?

13(a)	Derive an expression to determine the ratio of belt tensions in terms of angle of contact and coefficient of friction between pulley and belt	**(14)**	**3**	**3**
	(OR)			
13(b)	In Fig.4, if the load is lifted by applying a horizontal force, determine T_1, Torque and power transmitted.	**(14)**	**3**	**3**

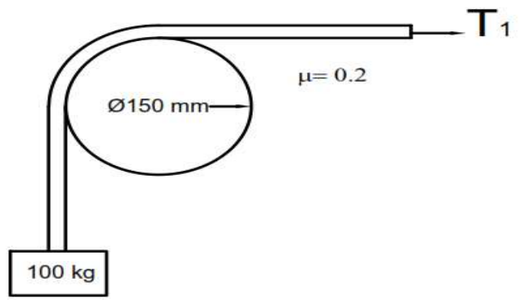

Fig. 4.

14(a)	Determine the outside surface area of and volume of the storage tank shown in Fig.5. Use Pappus-Guldinus theorem. All dimensions are in 'm'.	**(14)**	**4**	**3**

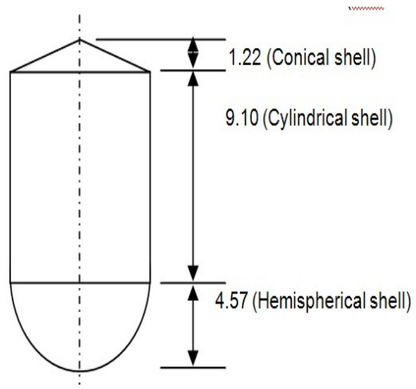

Fig. 5.

(OR)

14(b)	Determine the mass moment of inertia of a bar about the line parallel to cross section and passing through centre of gravity. Assume cross section of the bar is a square with side 'a'. Mass of the bar is 'm' and length is 'L'	**(14)**	**4**	**3**

15(a)	Two weights 800 N and 200 N are connected by a thread and they move along a rough horizontal plane under the action of force 'P' of 400 N applied to 800 N block as shown in Fig.6. Find the acceleration of the weights and tension in the thread.	**(14)**	**5**	**3**

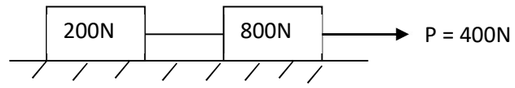

Fig.6.

15(b)	Explain the work- energy method and its application in a vehicle with an example.	**(14)**	**5**	**3**

PART- C (1 x 10 = 10 Marks)

(Q.No.16 is compulsory)

		Marks	CO	RBT LEVEL
16	In a laboratory experiment, students hang the masses shown (Fig 7) from a beam of negligible mass. (a) Determine the reaction at the fixed support A knowing that end D of the beam does not touch support E. (b) Determine the reaction at the fixed support A knowing that the adjustable support E exerts an upward force of 6 N on the beam. (c) Determine the range of values of the force exerted on the beam by the adjustable support E for which the magnitude of the couple at A does not exceed 2.5 Nm.	**(10)**	**1**	**5**

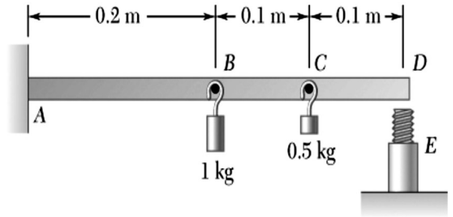

Fig 7.

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