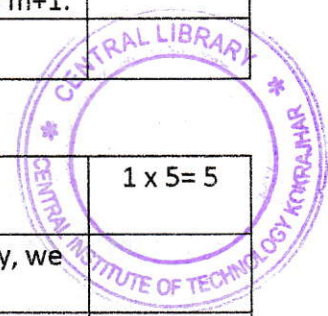


**END SEMESTER /RETEST EXAMINATION 2021****(New /Old syllabus)****Semester: 2nd****Subject code: Me-201****Subject: Engineering Mechanics****Full Marks:70 = (part A 25 + part B 45)****Duration: 3 hours****Instructions:**

Questions on Part A are compulsory.

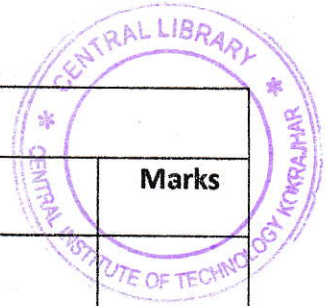
<b>PART- A MARK- 25</b>		
<b>Question No.</b>	<b>Questions</b>	<b>Marks</b>
Question 1	<b>Fill in the blanks with appropriate words:</b>	1 x 10= 10
1a	Forces whose lines of action pass through a common point is called-----Forces.	
1b	One kilogram force is equal to----- Newton.	
1c	The process of splitting up a force into components is called-----.	
1d	Moment of inertia of a circular section of diameter 'd' is-----.	
1e	The centre of gravity of a semi circle is at a distance of----- from the base.	
1f	A couple consists of two ----- forces of ----- magnitude.	
1g	The coefficient of friction is independent of----- of contact surface.	
1h	In ideal machine, the velocity ratio is equal to-----.	
1i	Capacity of doing work is known as-----.	
1j	A machine whose efficiency is more than 50% is called-----.	
Question No. 2	<b>Say true or false</b>	1 x 10= 10
2a	Force is a vector quantity.	
2b	SI unit of moment is N/m.	
2c	Polygon law of forces is applicable to more than two forces.	
2d	If the arm of a couple is doubled, its moment will be doubled.	
2e	The centre of gravity of an equilateral triangle with each side (a) is $a/2\sqrt{3}$ from any of the three sides.	

2f	SI unit of moment of inertia is $\text{cm}^4$ .	
2g	The force of friction always acts in the direction of motion of the body.	
2h	The efficiency of a lifting machine is the ratio of its mechanical advantage to its velocity ratio.	
2i	The maximum mechanical advantage of a lifting machine is $m+1$ .	
2j	1 watt is equal to 10 J/s.	



Question no. 3	<b>Choose the correct alternative amongst the given in the following statements:</b>	1 x 5= 5
3a	In order to determine the effects of a force acting on a body, we must know	
	<ul style="list-style-type: none"> <li>i) Its magnitude and direction of the line along which it acts.</li> <li>ii) Its nature.</li> <li>iii) Points through which it acts on the body.</li> <li>iv) All of the above.</li> </ul>	
3b	The Lami's theorem is applicable only for	
	<ul style="list-style-type: none"> <li>i) Coplanar forces.</li> <li>ii) Concurrent forces.</li> <li>iii) Coplanar concurrent forces.</li> <li>iv) Any type of forces.</li> </ul>	
3c	The moment of inertia of a triangular section of base (b) and height (h) about an axis through its C.G and parallel to the base is given by	
	<ul style="list-style-type: none"> <li>i) <math>bh^3/12</math></li> <li>ii) <math>bh^3/24</math></li> <li>iii) <math>bh^3/36</math></li> <li>iv) <math>bh^3/48</math></li> </ul>	
3d	The magnitude of the force of friction between two bodies, one lying above the other, depends upon the roughness of the	
	<ul style="list-style-type: none"> <li>i) Upper body</li> <li>ii) Lower body</li> <li>iii) Both the bodies</li> <li>iv) The body having more roughness</li> </ul>	
3e	The velocity ratio of a simple wheel and axle with 'D' as the diameter of effort wheel and 'd' as the diameter of load axle is	
	<ul style="list-style-type: none"> <li>i) <math>D/d</math></li> <li>ii) <math>d/D</math></li> <li>iii) <math>D/D-d</math></li> <li>iv) <math>d/D-d</math></li> </ul>	

Instructions: Answer any five questions



PART- B, MARK- 45		
Question No.	Questions	Marks
Question No. 4		
4a	State and prove Varignon's principle of moment.	4
4b	Find the magnitude and direction of the resultant of the concurrent forces of 8N, 12N, 15N and 20 N making angles $30^\circ$ , $70^\circ$ , $120^\circ$ , $150^\circ$ respectively from a fixed line.	5
Question No. 5		
5a	A beam AB of length 5m supported at A and B carries two point loads $W_1$ and $W_2$ of 3 KN and 5KN which are 1m apart. If the reaction at B is 2KN more than that at A, find the distance between the support A and load 3 KN.	7
5b	State parallelogram law of forces.	2
Question No. 6		
6a	Find the centre of gravity of an I section of the following dimensions Top flange=Bottom flange=60 cm $\times$ 10 cm, Web=50 cm $\times$ 10 cm.	7
6b	State Lami's theorem.	2
Question No. 7		
7a	A body of weight 500N is pulled up along an inclined plane having an inclination of $30^\circ$ with the horizontal. If the co-efficient of friction between the body and the plane is 0.25 and force being applied parallel to the plane, determine the force applied.	7
7b	Define coefficient of friction and angle of friction.	2
Question No. 8		
8a	The straight line motion of an object is given by $S=12t+3t^2-2t^3$ , where S=displacement in meters, t=time in seconds. Calculate displacement, velocity and acceleration after 2 seconds.	6
8b	Deduce the expression for maximum safe velocity of a vehicle against overturning on a level circular path.	3
Question No.9		
9a	Derive the relation between mechanical advantage, velocity ratio and efficiency of a machine.	3

9b	A simple wheel and axle has wheel and axle of diameters 300 mm and 30 mm respectively. What is the efficiency of the machine, if it can lift a load of 900 N by an effort of 100N?	6
Question No. 10		
10a	What is the law of machine? Derive an equation for the same.	5
10b	Write short note on reversible machine and self locking machine.	4

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