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.

PART- A MARK- 25		
Question No.	**Questions**	**Marks**
Question 1	**Fill in the blanks with appropriate words:**	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	**Say true or false**	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√3 from any of the three sides.	

2f	SI unit of moment of inertia is 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	**Choose the correct alternative amongst the given in the following statements:**	1 x 5= 5
3a	In order to determine the effects of a force acting on a body, we must know	
	i) Its magnitude and direction of the line along which it acts. ii) Its nature. iii) Points through which it acts on the body. iv) All of the above.	
3b	The Lami's theorem is applicable only for	
	i) Coplanar forces. ii) Concurrent forces. iii) Coplanar concurrent forces. iv) Any type of forces.	
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	
	i) $bh^3/12$ ii) $bh^3/24$ iii) $bh^3/36$ iv) $bh^3/48$	
3d	The magnitude of the force of friction between two bodies, one lying above the other, depends upon the roughness of the	
	i) Upper body ii) Lower body iii) Both the bodies iv) The body having more roughness	
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	
	i) D/d ii) d/D iii) D/D-d iv) d/D-d	

Instructions: Answer **any five** questions

PART- B, MARK- 45		
Question No.	**Questions**	**Marks**
Question No. 4		
4a	State and proof 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^{o}, 70^{o}, 120^{o}, 150^{o} 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×10 cm, Web=50 cm× 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^{o} 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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