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BTECH
(SEM II.) THEORY EXAMINATION 2020-21
ENGINEERING MECHANICS

Time: 3 Hours

Total Marks: 100

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt all questions in brief. 2 x 10 = 20

a.	State and prove varignon's theorem.
b.	Define parallelogram law of forces.
c.	Explain the laws of static friction.
d.	What do you mean by point of contraflexure?
e.	Define radius of gyration.
f.	What do you mean by linear motion? Give some examples of linear motion.
g.	What do you understand by velocity and acceleration?
h.	Define the terms: impulse and moment of momentum.
i.	Explain the various forms of mechanical energies.
j.	Define modulus of rigidity.

SECTION B

2. Attempt any three of the following: 10x3=30

a.	A uniform rod AB of length $3r$ remains in equilibrium on a hemispherical bowl of radius r as shown in fig. ignoring friction find the inclination of rod ' θ ' with the horizontal. <div style="text-align: center; margin: 10px 0;"> </div>
b.	A simply supported beam AB is carrying a uniformly distributed load of intensity w N/m. Draw the shear force and bending moment diagrams.
c.	From the first principle, determine the moment of inertia of a triangle about its centroidal axis parallel to the base.
d.	State and prove work energy principle.
e.	Define stress, strain and their types as well.

SECTION C

3. Attempt any one part of the following:

a.	A circular roller of radius 5 cm and weight 100 N rests on a smooth horizontal surface and is held in position by an inclined bar AB of length 10 cm as shown in fig. A horizontal force of 200 n is acting at B. Find the tension in the bar AB and vertical reaction at C. <div style="text-align: center; margin: 10px 0;"> </div>
b.	Derive the expression between tensions on tight side and slack side in a belt.



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4. Attempt any one part of the following:

a.	Draw shear force and bending moment diagram for given overhanging beam as shown in fig.	
b.	Figure shows a Warren girder consisting of seven members each of 3 m length freely supported at its end points. Find the forces in all the members of the girder.	

5. Attempt any one part of the following:

a.	Define Moment of inertia. State and prove perpendicular axis theorem
b.	Locate the centroid of the area of the parabolic shaded portion shown in figure .

6. Attempt any one part of the following:

a.	The motion of a particle is given by $a = t^3 - 3t^2 + 5$, where 'a' is acceleration in m/s^2 and 't' is time in seconds. The velocity of the particle at $t = 1$ second is $6.25 m/s$ and the displacement is $8.8 m$. Calculate the displacement and velocity at $t = 2$ seconds.
b.	A passenger sitting in a train moving at $54 km/hr$ is hit by a stone thrown at right angles to it with a velocity of $18 km/hr$. Calculate the velocity and direction with which the stone appears to hit the passenger.

7. Attempt any one part of the following:

a.	List the assumptions made in simple bending theory. Derive the simple bending equation.
b.	Draw a typical stress- strain curve for mild steel and explain the salient points on it.