Paper Id: 100326 Roll No:

B. TECH
(SEM-III) THEORY EXAMINATION 2019-20
ENGINEERING MECHANICS

Time: 3 Hours *Total Marks: 100*

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

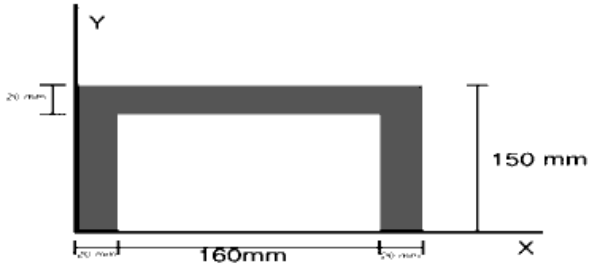
SECTION A

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

Qno.	Question	Marks	CO
a.	Define shear force and bending moment.	2	3
b.	How does a rigid body differ from an elastic body?	2	1
c.	Define center of mass and write down the coordinates of center of gravity of trapezoid	2	2
d.	Define work and power. Write the mathematical relation and SI unit	2	4
e.	State and prove law of conservation of momentum	2	4
f.	Enlist different types of supports and loading system	2	3
g.	Explain with the help of neat diagram, the concept of limiting friction	2	1
h.	Write down D'Alembert's Principle.	2	5
i.	Differentiate between stable and unstable equilibrium	2	5
j.	State parallel axis theorem. Define radius of gyration	2	2

SECTION B

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

Qno.	Question	Marks	CO
a.	State and prove Lami's theorem. The greatest and least resultant of two forces acting on body are 35KN and 5KN respectively. Determine the magnitude of the forces. What would be the angle between these forces if the magnitude of the resultant is stated to be 25 KN?	10	1
b.	Calculate the centroid of a semi-circular ring of radius 'r'. Using method of moments.	10	2
c.	Find moment of inertia of the figure about X-X axis, thickness of member is 20 mm 	10	3
d.	Differentiate between rectilinear and curvilinear motion. Also derive the expression for the Horizontal Range, Time of flight and maximum height of a projectile with initial velocity 'u' and inclined at an angle "α" with the horizontal.	10	4
e.	State Work Energy principle. A uniform cylinder of 125mm radius has a mass of 0.15 kg. This cylinder rolls without slipping along a horizontal surface with a translation velocity of 20cm/sec. Determine its total kinetic energy.	10	5

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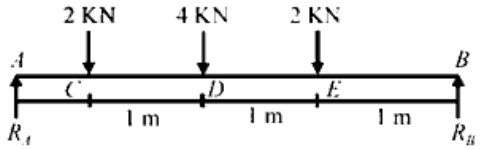
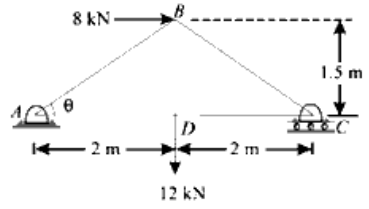
SECTION C

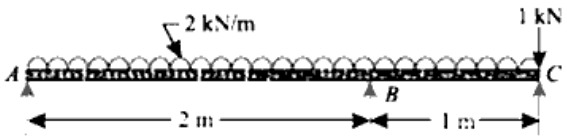
3. Attempt any *one* part of the following: 10x1=10

Qno.	Question	Marks	CO
a.	Explain how a wedge is used for raising heavy loads. Also mention the principle. A body resting on a rough horizontal plane required a pull of 24N inclined at 30° to the plane just to move it. It was also found that a push of 30N at 30° to the plane was just enough to cause motion to impend. Make calculations for the weight of body and the coefficient of friction.	10	1
b.	A ladder 5m long rests on a horizontal ground and leans against a smooth vertical wall at an angle 70° with the horizontal. The weight of the ladder is 900N and acts at its middle. The ladder is at the point of sliding, when a man weighing 750N stands 1.5m from the bottom of the ladder. Calculate coefficient of friction between the ladder and the floor.	10	2

4. Attempt any *one* part of the following: 10x1=10

Qno.	Question	Marks	CO
a.	Draw the SF and BM diagram for the simply supported beam loaded as shown in fig. 	10	3
b.	Define and explain the term imperfect truss Figure shows a framed of 4 m span and 1.5 m height subjected to two point loads at B and D. Find the forces in all the members of the structure. https://www.aktuonline.com 	10	4

5. Attempt any *one* part of the following: 10x1=10

Qno.	Question	Marks	CO
a.	Explain the principle of virtual work An overhanging beam ABC of span 3 m is loaded as shown in Fig.Using the principle of virtual work, find the reactions at A and B. 	10	5

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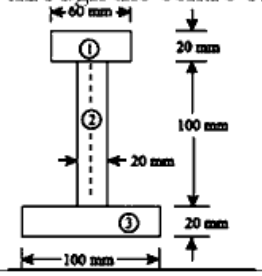
b.	In a reciprocating pump, the lengths of connecting rod and crank is 1125 mm and 250 mm respectively. The crank is rotating at 420 r.p.m. Find the velocity with which the piston will move, when the crank has turned through an angle of 40° from the inner dead centre	10	1

6. Attempt any *one* part of the following: 10x1=10

Qno.	Question	Marks	CO
a.	Derive an equation for moment of inertia of triangle centroidal axis and about its base	10	2
b.	An I-section is made up of three rectangles as shown in Fig. Find the moment of inertia of the section about the horizontal axis passing through the centre of gravity of the section. 	10	3

7. Attempt any *one* part of the following: 10x1=10

Qno.	Question	Marks	CO
a.	A body of mass 20kg moving towards with a velocity of 16m/s strikes with another body of 40 kg mass moving towards left with 50m/s. Determine (i) Final velocity of the two bodies (ii) Loss in kinetic energy due to impact (iii) Impulse acting on either body during impact Take coefficient of restitution as 0.65	10	4
b.	A particle starts with velocity u and the acceleration-velocity relationship is prescribed as a= -kv where k is a constant. Set up an expression that prescribes the displacement time relation for the particle	10	5