PAPER ID-411529

Roll No: | | | | | | | | | | | | | |

BTECH
(SEM III) THEORY EXAMINATION 2021-22
ENGINEERING MECHANICS

Time: 3 Hours *Total Marks: 100*

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

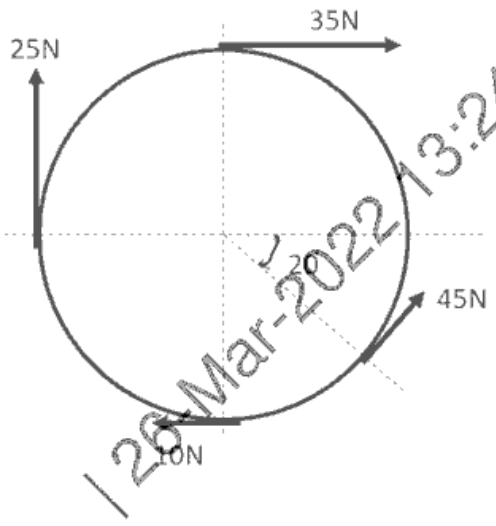
SECTION A

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

Q no.	Question	Marks	CO
a.	What is the difference between collinear and concurrent forces?	2	1
b.	Define the Limiting angle of friction.	2	1
c.	What is truss? Explain its types.	2	2
d.	Define the types of loads & supports in a beam.	2	2
e.	Define Mass moment of inertia & Area moment of inertia.	2	3
f.	What do you mean by types of motion?	2	3
g.	Explain D'Alembert's principle with suitable example.	2	4
h.	Define the longitudinal & lateral strain.	2	4
i.	What do you mean by pure bending in beams?	2	5
j.	Define a shaft & torsional rigidity.	2	5

SECTION B

2. Attempt any *three* of the following:

Q no.	Question	Marks	CO
a.	Four forces act tangentially to a circle of radius 200 mm as shown in figure. Find the magnitude, inclination & distance of the resultant from center of circle. 	10	1
b.	Draw the shear force & bending moment diagram for a loaded beam as shown in figure.	10	2

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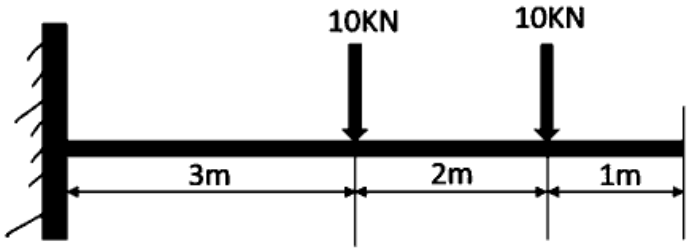
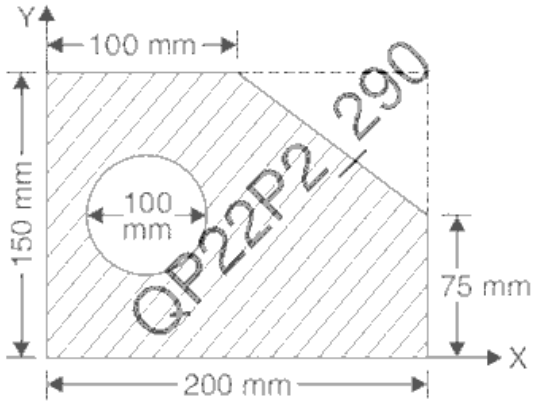
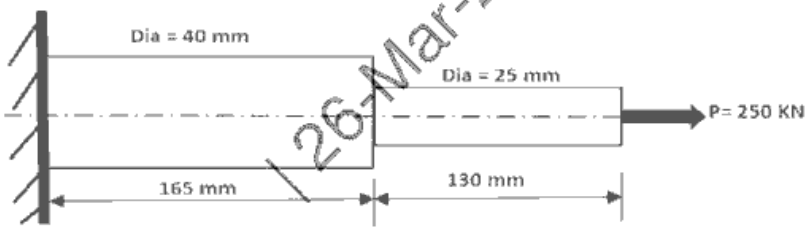


c.	Determine the co-ordinates XC and YC of the centre of a 100 mm diameter circular hole cut in a thin plate so that this point will be the centroid of the remaining shaded area shown in Fig. 	10	3
d.	A car, moving on a straight level road, skidded for a total distance of 60 meters after the brakes were applied. Determine the speed of the car just before the brakes were applied, if the co-efficient of friction between the car tyres and the road is 0.4. Take g = 9.80 m/s^2.	10	4
e.	Determine the total extension of the bar loaded as shown in figure. Take E = 2.5 MPa. 	10	5

SECTION C

3. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	A ladder 7 m long rests against a vertical wall with which is makes an angle 45^0 & resting on a floor. If a man whose weight is one half of that the ladder	10	1

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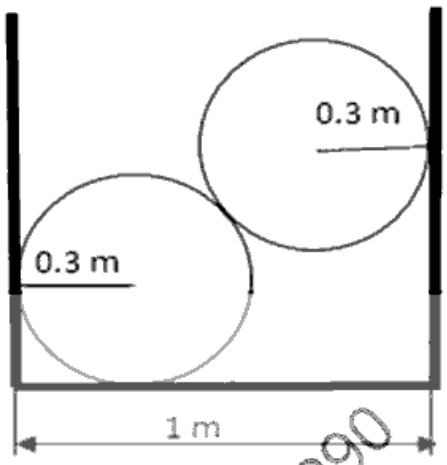
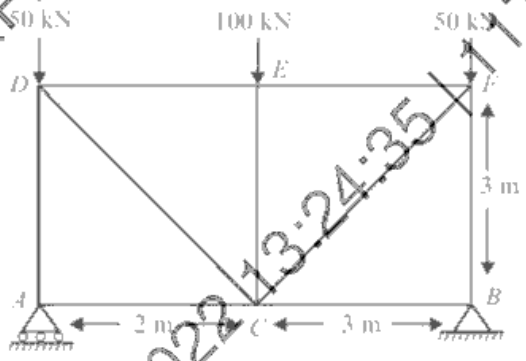
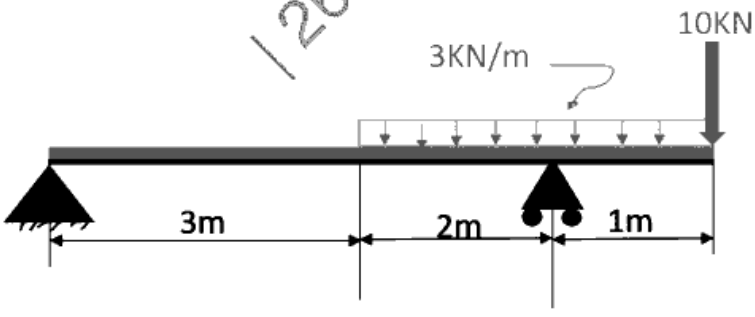
	climbs it, at what distance along the ladder will he be when ladder is about to slip? Take coefficient of friction between all contact surfaces 0.3.		
b.	The two cylindrical rollers of weight 50 N each are placed inside a cup as shown in figure. Find the reactions at points of contact. 	10	1

4. **Attempt any *one* part of the following:**

Q no.	Question	Marks	CO
a.	Determine the magnitude and nature of forces in members EF, FC and CB of the truss shown in figure. 	10	2
b.	Draw the shear force & bending moment diagram for the beam shown in figure also find out the value of maximum bending moment & position of point of contraflexure. 	10	2

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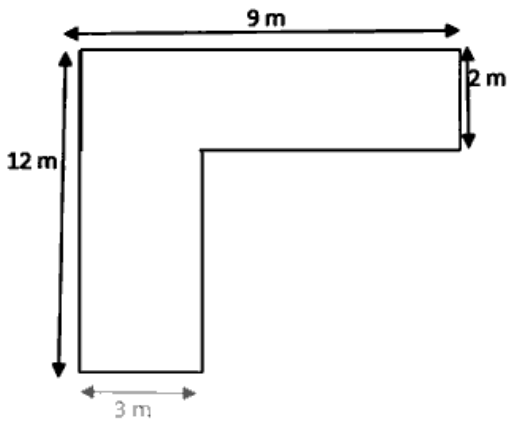
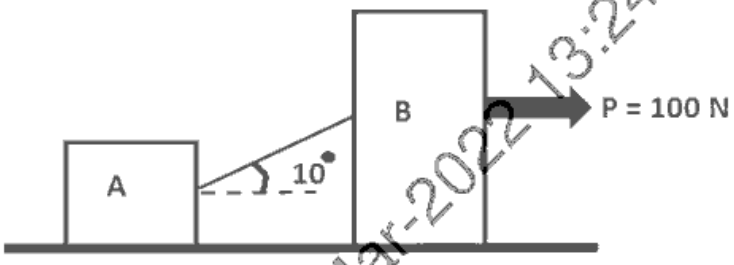
5. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Determine the moment of inertia of the 'L' section with respect to centroidal X-X axis. Section as shown in figure. 	10	3
b.	Derive an expression for mass moment of inertia about axis of symmetry for a right solid circular cone.	10	3

6. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	The equation of motion of a particle moving in a straight line is given by: $s = 9t + 7t^2 - 1.5t^3$, where s is the total, distance covered from the starting point in meters at the end of t seconds. Find the following:	10	4
b.	Two bodies A and B of masses 5 kg and 20 kg are connected by an inclined string. A horizontal force P of 100 N is applied to block B. Calculate the tension in the string and acceleration of the system. Take coefficient of friction for all surfaces as 0.25. Refer figure. 	10	4

7. Attempt any *one* part of the following:

Q no.	Question	Marks	CO
a.	Derive the Bending equation for pure bending in beams with assumptions. Also define the neutral axis & section modulus for a beam.	10	5
b.	Calculate the suitable diameter for a solid circular shaft to transmit 60 kW power at 200 rpm, if the twist is not to exceed 2^0 in 3 m length of the shaft and maximum shear stress is limited to 70 MN/m^2. Take shear modulus G = 90 GPa.	10	5