PAPER ID-411517

Subject Code: NME102

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

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGG MECHANICS

Time: 3 Hours ***Total Marks: 100***

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

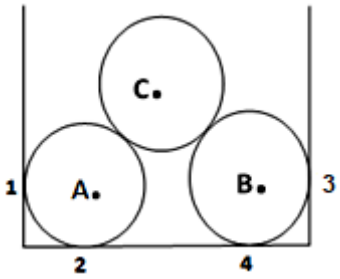
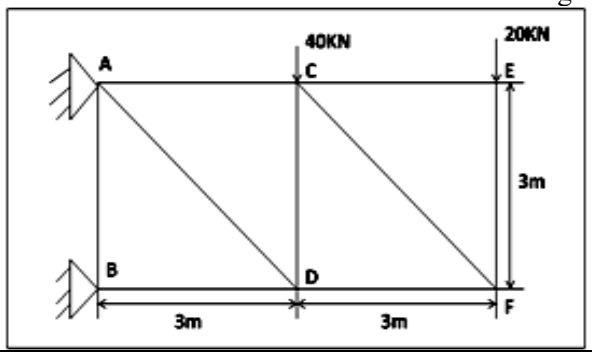
SECTION A

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

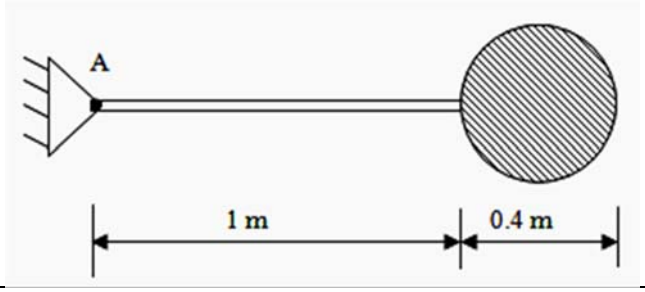
Q no.	Question
a.	State and explain parallelogram law of forces.
b.	What is equilibrium? State the necessary and sufficient conditions for a system of coplanar forces to be in equilibrium.
c.	What is truss? Explain its types and assumptions taken in analysis.
d.	Explain the types of beams with neat figures.
e.	State and explain theorem of parallel axis.
f.	Differentiate between centroid and center of gravity.
g.	Write D'Alembert's principle for linear and angular motion.
h.	What is relative velocity? How relative velocity is determined?
i.	Define neutral layer and neutral axis.
j.	Define torsional rigidity and section modulus.

SECTION B

2. Attempt any *three* of the following: 10 x 3 = 30

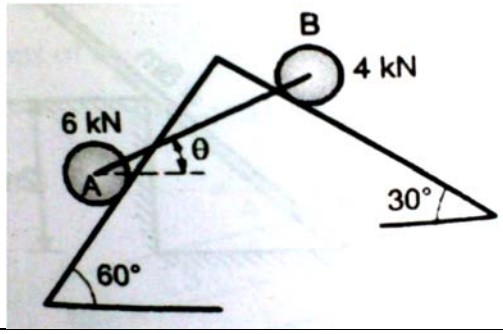
Q no.	Question
a.	Three cylinders A, B and C each weighting 100 N and diameters 80 mm are placed in a channel of 180 mm width as shown in figure. Determine the pressure exerted by the cylinder A and B at the point of contact.1, 2, 3 & 4. 
b.	Determine magnitude and nature of forces in all members of following truss figure. 
c.	A solid cone of base 100 mm and height 200mm joins to base with cylinder of base 100mm and height 200 mm. compute the centre of gravity of this composite body.

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGG MECHANICS

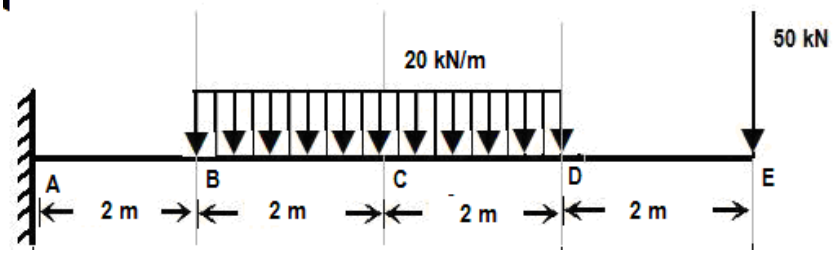
d.	A cylinder weighing 500 N is welded to a 1 m uniform bar of 200 N as shown in Figure. Determine the acceleration with which the assembly will rotate about point A, if released from rest in horizontal position. Determine reaction at A at this instant. 
e.	Explain the stress-strain diagram for a ductile material in detail with neat figure.

SECTION C

3. Attempt any *one* part of the following: 10 x 1 = 10

Q no.	Question
a.	Two rollers of weight W_A = 6KN, W_B = 4 KN are connected by a rod as shown in figure. Find the tension in the rod and the angle that make with the horizontal when the system is in equilibrium. 
b.	Explain the terms: (i) Wet and Dry friction, (ii)Angle of friction, (iii) Angle of Repose, & (iv) Cone of friction

4. Attempt any *one* part of the following: 10 x 1 = 10

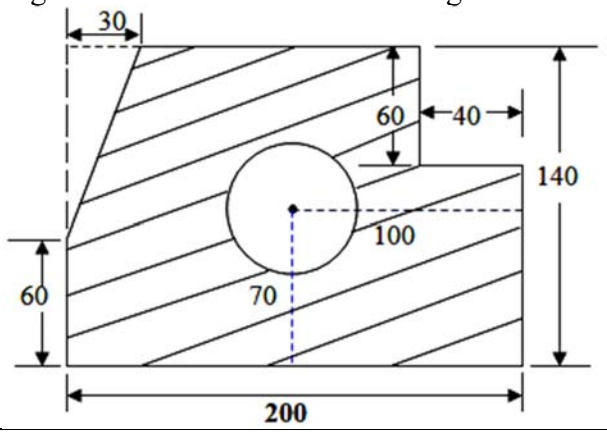
Q no.	Question
a.	What do you mean by perfect & imperfect truss? Compare method of joints with method of section.
b.	Draw shear force and bending moment diagram for the beam shown in figure. 

PAPER ID-411517

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

BTECH
(SEM I) THEORY EXAMINATION 2021-22
ENGG MECHANICS

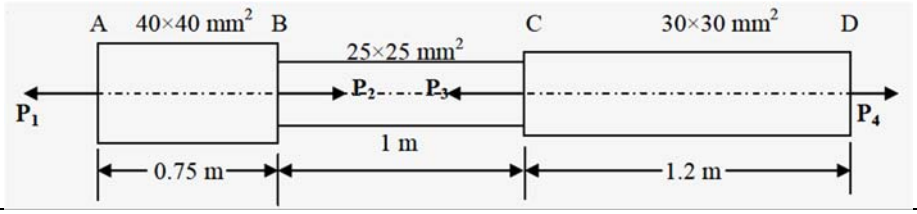
5. Attempt any *one* part of the following: 10 x 1 = 10

Q no.	Question
a.	Calculate centroid of given shaded area as shown in figure. 
b.	Derive an expression for mass moment of inertia of rectangular plate. Also find out centre of gravity for a hemisphere.

6. Attempt any *one* part of the following: 10 x 1 = 10

Q no.	Question
a.	Two cars are travelling toward each other on a single lane road at the velocities 12 m/s and 9 m/s respectively. When 100 m apart, both drivers realize the situation and apply their brakes. They succeed in stopping simultaneously and just short of colliding. Assume constant deceleration for each case and determine (a) time required for car to stop (b) deceleration of each car (c) the distance travelled by each car.
b.	A wheel rotating about a fixed axis at 20 revolutions per minute is uniformly accelerated for 70 sec during which it makes 50 revolutions. Find the (i) angular velocity at the end of this interval and (ii) time required to reach 100 revolutions per minute.

7. Attempt any *one* part of the following: 10 x 1 = 10

Q no.	Question
a.	A member ABCD is subjected to point load P_1, P_2, P_3 and P_4 as shown in figure. Calculate the force P_3 necessary for equilibrium if $P_1 = 120$ kN, $P_2 = 220$ kN and $P_4 = 160$ kN. Determine also the net change in the length of the member. Take $E = 2\times10^5$ N/mm^2. 
b.	Determine the diameter of solid shaft which will transmit 450 kW at 300 rpm. The angle of twist must not exceed 1° per meter length and maximum torsional stress is to be limited to 40 N/mm^2. Assume, G = 80 kN/mm^2.