Roll No:													

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
ENGINEERING MECHANICS & STRENGTH MATERIAL

TIME: 3 HRS **M.MARKS: 70**

Note: Attempt all Sections. In case of any missing data; choose suitably.

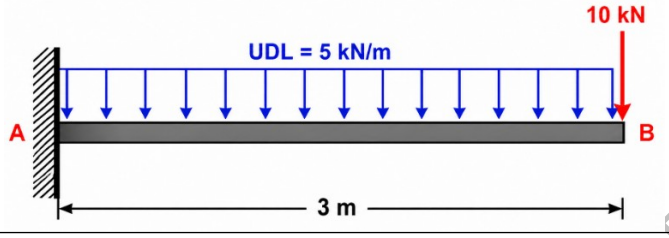
SECTION A

1. Attempt *all* questions in brief. **02 x 7 = 14**

Q no.	Question	CO	Level
a.	200 N block on rough surface (μ = 0.25). Find maximum friction.	1	K1
b.	What is limiting friction?	1	K1
c.	Find centroid of a semicircle (r = 10 cm).	2	K2
d.	A rod elongates 1 mm under 50 kN. Find strain (L = 1 m).	2	K1
e.	What is torsional rigidity?	3	K1
f.	A beam carries moment 1 kNm. Find stress ($Z = 5\times10^{-5}$ m³).	4	K1
g.	Column length = 2 m, k = 0.5. Find effective length.	5	K1

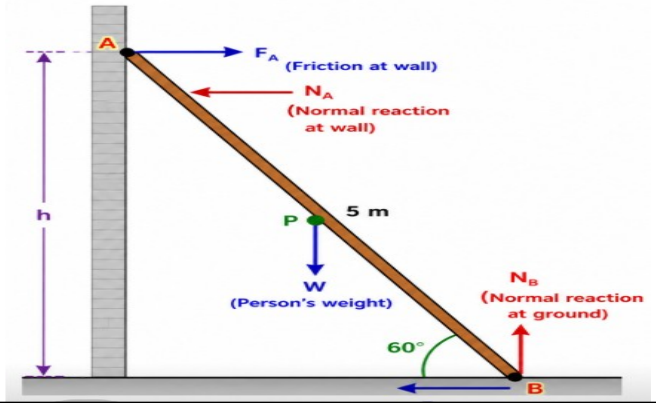
SECTION B

2. Attempt any *three* of the following: **07 x 3 = 21**

Q no.	Question	CO	Level
a.	A 600 N block rests on a rough plane inclined at 25°. A force is applied parallel to plane. Find the force required to just move it upward and downward (μ = 0.3).	1	K2
b.	A bar is subjected to: Tensile stress = 120 MPa, Shear stress = 60 MPa Find principal stresses and max shear stress.	2	K2
c.	A cantilever beam (length 3 m) carries: UDL = 5 kN/m, Point load = 10 kN at free end. Find slope and deflection at free end. 	3	K2
d.	A helical spring: Wire dia = 10 mm, Mean dia = 80 mm, Load = 500 N Find deflection and shear stress.	4	K2
e.	A thin cylinder: Diameter = 1 m , Thickness = 10 mm, Pressure = 2 MPa Find: Hoop stress, Longitudinal stress and Volumetric strain	5	K2

SECTION C

3. Attempt any *one* part of the following: **07 x 1 = 07**

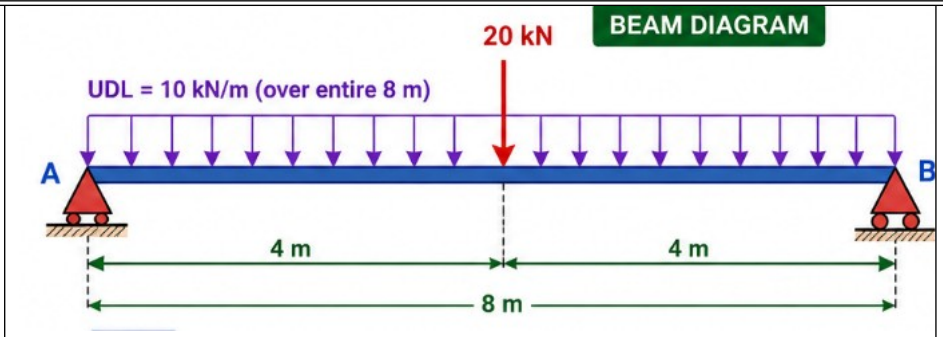
Q no.	Question	CO	Level
a.	A ladder 5 m long rests against a wall at 60°, μ (ground) = 0.4, μ (wall) = 0.3. Find the maximum height a person can climb before slipping. 	1	K2
b.	A beam (span 8 m) carries: UDL = 10 kN/m, Point load = 20 kN at mid Draw SFD & BMD and find max bending moment.	1	K2

Paper ID : 261206

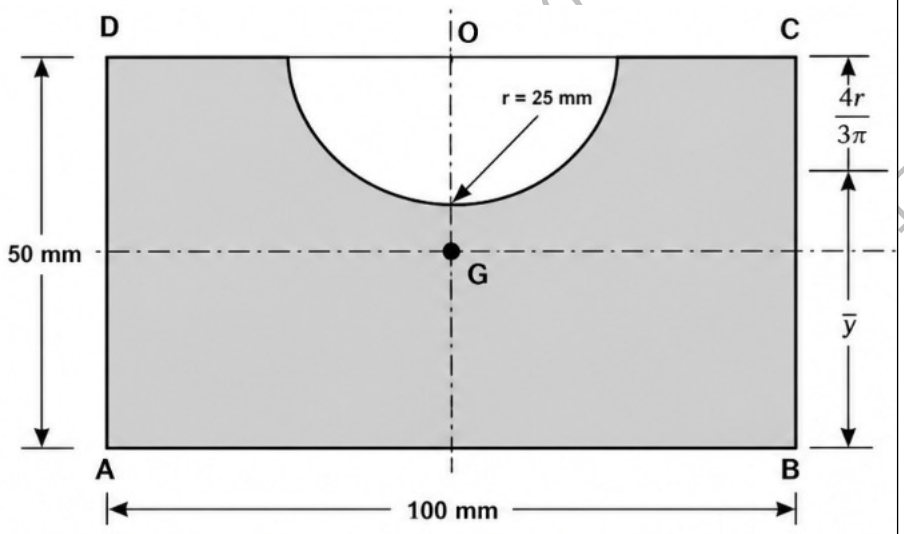
Roll No:													

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
ENGINEERING MECHANICS & STRENGTH MATERIAL

TIME: 3 HRS **M.MARKS: 70**



4. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	Find centroid of a composite area: rectangle (100×50 mm) with a semicircle cut-out (r = 25 mm). 	2	K2
b.	Construct Mohr's Circle for: σ_x = 80 MPa, σ_y = 20 MPa, τ_{xy} = 40 MPa. Find principal stresses and angle.	2	K2

5. Attempt any *one* part of the following: 07 x 1 = 07

Q no.	Question	CO	Level
a.	A laminated steel spring 1 m long is to support central load of 5·8 kN. If the maximum deflection of spring is not to exceed 45 mm and maximum stress should not exceed 300 MN/m^2, calculate: (i) The thickness of the leaves; (ii) Their number if each plate is to be 80 mm wide. Take: E = 200 GN/m^2.	3	K2
b.	A hollow shaft has internal diameter 60 mm and external diameter 100 mm. Find torque capacity compared to solid shaft of same area.	3	K2

Roll No:													

BTECH
(SEM. IV) THEORY EXAMINATION 2025-26
ENGINEERING MECHANICS & STRENGTH MATERIAL

TIME: 3 HRS **M.MARKS: 70**

6. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	A closely coiled helical spring is to carry a load of 500 N. Its mean coil diameter is to be 10 times that of the wire diameter. Calculate these diameters if the maximum shear stress in the material of the spring is to be 80 MN/m^2.	4	K2
b.	Derive the expression for the critical buckling for a column having one end fixed and the other end free.	4	K2

7. Attempt any *one* part of the following: **07 x 1 = 07**

Q no.	Question	CO	Level
a.	A built up cylindrical shell of 300 mm diameter, 3 m long and 6 mm thick is subjected to an internal pressure of 2 MN/m^2. Calculate the change in length and diameter of the cylinder under that pressure if the efficiencies of the longitudinal and circumferential joints are 80% and 50% respectively. E = 200 GN/m^2; μ = 1/3·5.	5	K2
b.	A rotating cylinder: Radius = 0.5 m, Speed = 3000 rpm. Find induced stresses.	5	K2