University of Mumbai

Examination 2020

Examinations Commencing from 23rd December 2020 to 6th January 2021 and from 7th January 2021 to 20th January 2021

Program: Civil Engineering

Curriculum Scheme: Rev2019

Examination: SE Semester III

Course Code: _CEC302____ and Course Name: _Mechanics of Solids___

Time: 2-hour Max. Marks: 80

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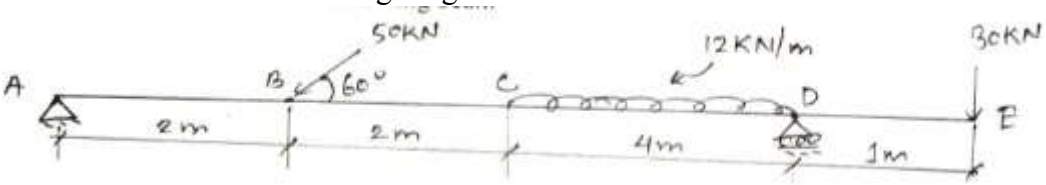
Q1.	**Choose the correct option for following questions. All the Questions are compulsory and carry equal marks**
1.	Choose the Correct Effective length (Le) of Column which is fixed at one end and free at another end. Take length of Column as 'L'.
Option A:	Le=L
Option B:	Le=(L/2)
Option C:	Le=2L
Option D:	Le=1.5L
2.	What is the safe load acting on a long column of 2 m having diameter of 40 mm. The column is fixed at both the ends and modulus of elasticity is 2 x 105 N/mm2? (F.O.S = 2)
Option A:	120 kN
Option B:	124 kN
Option C:	130 kN
Option D:	150 kN
3.	Which of the following assumptions are made in torsion theory?
Option A:	Shaft is perfectly straight
Option B:	Material of the shaft is heterogeneous
Option C:	Twist cannot be uniform along the length of the shaft
Option D:	All of the above
4.	Macaulay's method is used to determine _____
Option A:	Deflection
Option B:	Strength
Option C:	Toughness
Option D:	Torsion
5.	A simply supported beam carries uniformly distributed load of 20 kN/m over the length of 5 m. If flexural rigidity is 30000 kN.m2, what is the maximum deflection in the beam?
Option A:	5.4 mm
Option B:	1.08 mm
Option C:	6.2 mm
Option D:	8.6 mm
6.	The bending formula is given as _____

Option A:	(M/E) = (σ/y) = (R/I)
Option B:	(M/y) = (σ/I) = (E/R)
Option C:	(M/I) = (σ/y) = (E/R)
Option D:	(M/I) = (σ/y) = (E*R)
7.	What is the value of thermal stress, if a rod of 3 m is heated at 50^0 C and is fixed at both the ends? (Take α = 10 x 10-6 /^{0}C & E= 200 x 103 Mpa)
Option A:	25 Mpa
Option B:	50 Mpa
Option C:	100 Mpa
Option D:	150 Mpa
8.	The value of elasticity increases, when temperature _____
Option A:	increases
Option B:	decreases
Option C:	remains constant
Option D:	none of the above
9.	What is the bulk modulus of a material, if a cube of 100 mm changes its volume to 4000 mm^3 when subjected to compressive force of 2.5 x 106 N?
Option A:	62.5 Gpa
Option B:	65 Gpa
Option C:	67.5 Gpa
Option D:	70 Gpa
10.	The relation between modulus of elasticity (E), modulus of rigidity (G) and bulk modulus (K) is given as _____
Option A:	K+G / (3K+ G)
Option B:	3 KG / (3K+ G)
Option C:	3 KG / (9K+ G)
Option D:	9 KG / (3K+ G)
11.	Relation between Load (W) and Shear Force (V)
Option A:	(dV/dx)= W
Option B:	(dW/dx)= V
Option C:	No relation
Option D:	∫Vdx= W
12.	A cantilever beam of span L carries a UVL of W kN/m. Maximum shear force is _____
Option A:	WL
Option B:	WL/2
Option C:	W
Option D:	WL/3
13.	A 200 mm long, stress free rod at room temperature is held between two immovable rigid walls. The temperature of the rod is uniformly raised by 250°C. If the Young's modulus and coefficient of thermal expansion are 200GPa and1×10−5 /°C, respectively, the magnitude of the longitudinal stress (in MPa) developed in the rod is ____.

Option A:	450 MPa
Option B:	500 MPa
Option C:	525 MPa
Option D:	550 MPa
14.	Calculate the Strain energy stored in a body of stress 0.0366 N/mm^2. The cross-sectional area is 60 m^2 and length of body is 1 m. Take E = 2×10^5 N/mm^2.
Option A:	0.2009 N.mm
Option B:	0.0416 N.mm
Option C:	0.0987 N.mm
Option D:	0.1316 N.mm
15.	The angle between normal stress and tangential stress is known as angle of _____
Option A:	Declination
Option B:	Orientation
Option C:	Obliquity
Option D:	Rotation
16.	The graphical method of Mohr's circle represents shear stress (τ) on _____
Option A:	X-axis
Option B:	Y-axis
Option C:	Z-axis
Option D:	In between X and Y axis
17.	For a Circular cross-section Maximum Shear Stress= _____ of Average Shear Stress
Option A:	2/3
Option B:	3/2
Option C:	4/3
Option D:	2
18.	Average shear stress in a beam is (Shear force is 'V')
Option A:	V/Z
Option B:	V/A
Option C:	V/M
Option D:	((VAy)/bI)
19.	The bending stress is _____
Option A:	Directly proportional to the distance of layer from the neutral layer
Option B:	Inversely proportional to the distance of layer from the neutral layer
Option C:	Directly proportional to the neutral layer
Option D:	Does not depend on the distance of layer from the neutral layer
20.	A hollow circular shaft has an outer diameter of 100 mm and a wall thickness of 25 mm. The allowable shear stress in the shaft is 125 MPa. The maximum torque the shaft can transmit is
Option A:	46 kN-m
Option B:	24.5 kN-m
Option C:	23 kN-m

Option D:	11.5 kN-m

Q2	**Solve any two out of three**	**10 marks each**
A	Draw SFD and BMD for the giving beam shown below. 	
B	The external and internal diameter of a hollow cast iron column are 6cm and 3cm respectively. If the length of the column is 3.5m and both of its ends are fixed, Determine the crushing load using Rankine's Formula. Take the value of σc = 550N/mm^2 and α = 1/1600 in Rankine's formula.	
C	At a point in a strained material the stresses on two mutually Perpendicular plane are 100MPa (Tensile) and 60MPa (Comp) accompanied with shear stress of 40MPa. Find the magnitude and direction of Resultant Stress on the oblique plane which makes an angle of 60^0 with plane of 60MPa stress.	

Q3	**Solve any Two Questions out of Three**	**10 marks each**
A	A Beam AB supported at its ends has a span of 2m and carries a UDL of 200KN/m over the entire span. The cross section of the beam is a T-Section, having flange 125mm*25mm, web thickness 25mm and overall depth 200mm. Calculate the maximum shear stress in the beam and draw shear stress distribution diagram.	
B	A closed cylindrical vessel made of steel plates 5mm thick with plane ends carries fluid under pressure of 4N/mm^2. The diameter of the cylinder is 275mm and length is 775mm. Calculate longitudinal and Hoop stresses in the cylinder wall and determine length and volume of cylinder. Take E= 2*10^5 and μ = 0.270.	
C	A I-section girder 250mm deep has 20mm thick web. The top flange is 120mm * 20mm and bottom flange is 160mm*20mm. The UDL on the Girder is 8kN/m and the maximum stress due to bending is limited to 70N/mm^2. Determine the maximum simply supported span on which the girder can be supported. Also determine the percentage of bending moment resisted by the flanges.	