Reg. No.															

Question Paper Code	14465

B.E. / B.Tech. - DEGREE EXAMINATIONS, APRIL / MAY 2026

Fourth Semester

Mechanical Engineering

(Common to Mechanical and Automation Engineering)

24CEPC405 - STRENGTH OF MATERIALS

Regulations - 2024

Duration: 3 Hours | Max. Marks: 100

PART – A (i) (MCQ)
(16 × 1 = 16 Marks)
Answer ALL Questions

		Marks	K – Level	CO
1.	The slope of the stress-strain curve in the elastic deformation region is a) Elastic modulus b) Plastic modulus c) Poisson's ratio d) None of the mentioned	1	K1	CO1
2.	Where is the necking region? a) The area between lower yield point and upper yield point b) The area between the plastic limit and elastic limit c) The area between the ultimate point and initial point d) The area between the ultimate point and rupture	1	K1	CO1
3.	Elastic limit is the point _____ a) up to which stress is proportional to strain b) At which elongation takes place without application of additional load c) Up to which if the load is removed, original volume and shapes are regained d) None of the mentioned	1	K1	CO1
4.	The length, Young's modulus and coefficient of thermal expansion of bar P are twice that of bar Q. what will be the ration of stress developed in bar P to that in bar Q if the temperature of both bars is increased by the same amount? a) 2 b) 8 c) 4 d) 16	1	K2	CO2
5.	The thermal stress is a function of _____ P. Coefficient of linear expansion Q. Modulus of elasticity R. Temperature rise a) P and Q b) Q and R c) Only P d) Only R	1	K1	CO2
6.	Which one of the following pairs is NOT correctly matched? a) Temperature strain with permitted expansion – ($\alpha Tl - \delta$) b) Temperature thrust – (αTE) c) Temperature stress – (αTEA) d) Temperature stress with permitted expansion – $E(\alpha Tl - \delta) / l$	1	K2	CO2
7.	If the thickness of plate is negligible when compared to the diameter of the cylindrical, then it is called _____ a) Thick cylinder b) Thin cylinder c) Hoop cylinder d) Circumferential cylinder	1	K1	CO3
8.	In thin cylinders, the thickness should be _____ times of internal diameter. a) 1/20 b) 1/15 c) 1/30 d) 1/40	1	K2	CO3
9.	Oil tanks, steam boilers, gas pipes are examples of _____ a) Thick shells b) Thin cylinders c) Hoop cylinders d) Longitudinal cylinders	1	K1	CO3

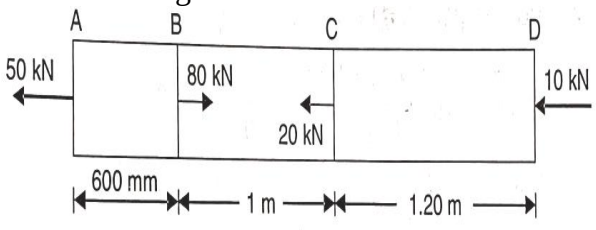
10.	Torsional sectional modulus is also known as _____ a) Polar modulus b) Sectional modulus c) Torsion modulus d) Torsional rigidity	*1*	*K1*	*CO4*
11.	_____ is a measure of the strength of shaft in rotation. a) Torsional modulus b) Sectional modulus c) Polar modulus d) Torsional rigidity	*1*	*K1*	*CO4*
12.	The power transmitted by shaft SI system is given by _____ a) $2\pi NT/60$ b) $3\pi NT/60$ c) $2\pi NT/45$ d) NT/60 W	*1*	*K2*	*CO4*
13.	A beam is said to be of uniform strength, if _____ a) B.M. is same throughout the beam b) Shear stress is the same through the beam c) Deflection is the same throughout the beam d) Bending stress is the same at every section along its longitudinal axis	*1*	*K1*	*CO5*
14.	Which stress comes when there is an eccentric load applied? a) Shear stress b) Bending stress c) Tensile stress d) Thermal stress	*1*	*K1*	*CO5*
15.	Deflection Equations method was developed by:- a) Mohr b) Bernoulli c) Maxwell d) Mohr and manderla	*1*	*K1*	*CO6*
16.	What is the Degree of freedom of this beam? a) 1 b) 2 c) 3 d) 4	*1*	*K1*	*CO6*

PART – A (ii) (Short Answer Questions)
(6 × 3 = 18 Marks)
Answer ALL Questions

17.	Explain longitudinal strain and lateral strain.	*3*	*K2*	*CO1*
18.	What is the use of Mohr's circle?	*3*	*K2*	*CO2*
19.	List out the modes of failure in thin cylindrical shell due to an internal pressure.	*3*	*K2*	*CO3*
20.	Define the term stiffness of a spring.	*3*	*K3*	*CO4*
21.	Write the equation for the simple bending theory.	*3*	*K3*	*CO5*
22.	State Maxwell's reciprocal theorem.	*3*	*K3*	*CO6*

PART - B (Descriptive Answer Questions)
(6 × 11 = 66 Marks)
Answer ALL Questions

23.	a)	A brass bar having cross sectional area 1000 mm^2 is subjected to axial forces as shown in fig. calculate total elongation of the bar. Take E = 1.05×10^5 N/mm^2.	*11*	*K3*	*CO1*

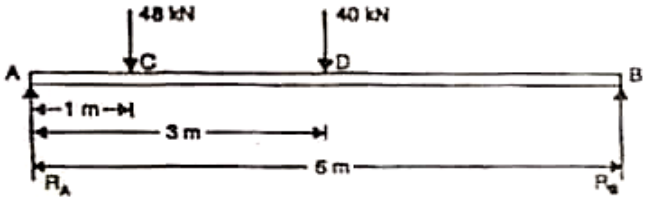


OR

	b)	In an experiment, a bar of 30 mm diameter is subjected to a pull of 60 kN. The measured extension on gauge length of 200 mm is 0.09 mm and the change in diameter is 0.0039 mm. Calculate the Poisson's ratio and the values of the three moduli.	*11*	*K3*	*CO1*

24.	a)	A Steel rod of diameter 20 mm passes centrally through a copper tube with external diameter 40 mm and internal diameter 30 mm. The tube is closed at each end with rigid plate of negligible thickness. If the temperature of the assembly is raised by 60°C, calculate the stresses developed in steel and copper. E_S = 200 GPa E_C = 100 GPa $\alpha_S = 12 \times 10^{-6}$/ °C $\alpha_C = 18 \times 10^{-6}$/ °C.	*11*	*K3*	*CO2*
		OR			
	b)	At a certain point in a strained material, the intensities of stresses on two planes at right angles to each other are 20 N/mm^2 and 10 N/mm^2 both tensile. They are accompanied by a shear stress of magnitude 10 N/mm^2. Find graphically the location of principal planes and evaluate the principal stresses.	*11*	*K3*	*CO2*
25.	a)	Determine the maximum and minimum hoop stress across the section of a pipe of 400 mm internal diameter and 100mm thick, when the pipe contains a fluid at a pressure of 8N/mm^2. Also sketch the radial pressure distribution and hoop stress distribution across the section.	*11*	*K3*	*CO3*
		OR			
	b)	Calculate change in diameter, change in length and change in volume of thin cylinder shell 100 cm diameter, 1 cm thick and 5 m long when subjected to internal pressure of 3N/mm^2. Take the value of E=2x10^5 N/mm^2 and Poisson's ratio =0.30.	*11*	*K3*	*CO3*
26.	a)	A hollow as haft is to transmit 300 KW power at 80 rpm. If the shear stress is not exceeded 60 N/mm^2, find the external and internal diameter is 0.6 times of external diameter find the external and internal diameters assuming that the maximum torque is 1.4 times the mean torque.	*11*	*K3*	*CO4*
		OR			
	b)	A closely coiled helical spring of mean diameter 20 cm is made if 3cmdiameter rod and has 16 turns. A weight of 3 KN is dropped on this spring. Find the height by which the weight should be dropped before striking the spring so that the spring may be compressed by 18cm. take C=8x10 4N/mm^2.	*11*	*K3*	*CO4*
27.	a)	Draw the shear force and bending moment diagrams for a simply supported beam of span 9m. The beam carries a UDL of 10 kN/m for a distance of 6m from the left support. Find the maximum value and their position. Give the values at important points in the diagram.	*11*	*K3*	*CO5*
		OR			
	b)	A hollow circular bar having outside diameter twice the inside diameter is used as a beam. From the bending moment diagram of the beam, it is found that the bar is subjected to a bending moment of 40 kNm. If the allowable bending stress in the beam is to be limited to 100 N/mm^2, calculate the inside diameter of the bar.	*11*	*K3*	*CO5*

28. a) A beam of length 6m is simply supported at its ends and carries tow point loads of 48 KN and 40 KN at a distance of 1m and 3m respectively from the left support as shown in fig. Using Macaulay's method find: *11 K3 CO6*
(i) Deflection under each load,
(ii) Maximum deflection, and
(iii) The point at which maximum deflection occurs,
Given $E=2x10^5$ N/mm^2 and $I=85x10^6$ mm^4.



OR

b) Calculate the safe compressive load on a hollow cast iron column (one end rigidly fixed and the other hinged) of 150 mm external diameter, 100 mm internal diameter and 10 m length. Use Euler's formula with a factor of safety of 5, and E = 95 GPa. *11 K3 CO6*