Hall Ticket Number:

Code No. : 13115

VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (Civil Engg.: CBCS) III-Semester Main Examinations, December-2018

Strength of Materials-I

Time: 3 hours Max. Marks: 60

*Note: Answer **ALL** questions in **Part-A** and any **FIVE** from **Part-B***

Q.No.	Stem of the question	M	L	CO	PO
	Part-A (10 × 2 = 20 Marks)				
1.	Define ductility of a material. Cite any two examples of ductile materials.	2	1	1	1
2.	Compute the expansion of a rod of 2.5m length when its temperature is raised by 60^0C above the ambient temperature. Take $\alpha = 12\times10^{-6}/^0$C	2	2	1	2
3.	Draw the Shear Force Diagram for a cantilever beam of span 2m is subjected to a uniformly distributed load of 15 kN/m.	2	2	2	2
4.	A simply supported beam of span 5m is subjected to a point load of 60kN at a distance of 3 m from the left end. Draw the Bending Moment Diagram.	2	2	2	2
5.	Compute the section modulus of a hollow rectangular section with outer dimensions 200mm(width)×140mm (depth) and a thickness of 20mm about a horizontal axis passing through its mid-depth.	2	2	3	2
6.	Sketch the shear stress distribution across the depth of a rectangular section of a beam of dimensions B×D and subjected to a shear force F at a section.	2	2	2	2
7.	Sketch the core of a hollow circular section of external diameter D and internal diameter d.	2	1	3	2
8.	Define principal stress and principal strain.	2	1	4	1
9.	A spherical vessel of 2 m diameter is subjected to an internal pressure of 3 N/mm^2. Compute the thickness of the plate required if maximum stress is not to exceed 150 N/mm^2.	2	2	5	2
10.	State the formulae to compute circumferential and radial stresses across the thickness of a thick cylindrical shell using Lame's theory.	2	1	5	1
	Part-B (5 × 8 = 40 Marks)				
11. a)	A steel rod 4 m long and 20 mm diameter is subjected to an axial tensile load of 40kN. Compute the change in length, diameter and volume of the rod. Take E = 2×10^5 N/mm^2 and Poisson's ratio μ= 0.25.	4	2	1	2
b)	A steel rod of 25 mm diameter passes centrally through a hollow copper tube of internal and external diameters of 35 mm and 45 mm respectively. The tube is closed at either end with thin washers and nuts are tightened over them. If the temperature of the assembly is raised by 50^0 C, compute the stresses developed in the rod and the tube. Adopt $E_S = 2\times10^5$ N/mm^2 and $E_C = 1\times10^5$ N/mm^2, $\alpha_S = 12\times10^{-6}/^0$C and $\alpha_C = 18\times10^{-6}/^0$C.	4	2	1	2
12. a)	A cantilever beam of span 4m subjected to uniformly distributed load of 20 kN/m over the entire span in addition to a point load of 100 kN at the free end. Analyze the beam and draw the shear force and bending moment diagrams.	4	4	2	2

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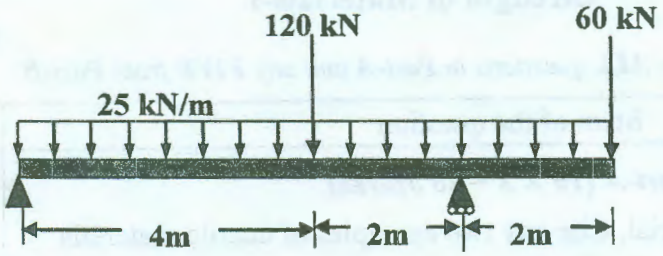
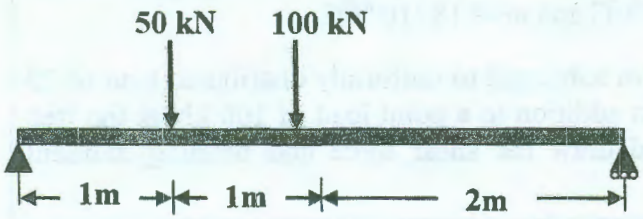
	b) Analyze the overhanging beam as shown in the figure and draw the shear force and bending moment diagrams. Mark all the salient values. 	4	4	2	2
13.	a) Derive the formula of theory of simple bending: $\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R}$	4	2	2	1
	b) A beam of T-section has the flange 250 mm wide and 25 mm thick and web 50 mm wide and 400 mm deep. It carries a shear force of 200 kN at a cross section. Compute shear stresses at salient points and sketch shear stress distribution across the depth of the T-section.	4	3	2	2
14.	a) A hollow circular chimney of internal diameter 2.2 m and thickness 0.3 m is 20 m tall. Density of the material of the chimney is 25kN/m^3. Compute wind load the chimney can resist *so that no tension develops anywhere on the chimney*. Assume that wind acts uniformly across the height of the chimney.	4	3	3	2
	b) At a certain point in a strained material, the stresses on two planes at right angles to each other are 25 N/mm^2 and 15 N/mm^2, both tensile. Compute the location of the principal planes and evaluate the principal stresses.	4	3	4	2
15.	a) Compute the thickness of metal necessary for a thin cylindrical shell of internal diameter 120mm to withstand an internal pressure of 8 N/mm^2. The maximum hoop stress in the section is not to exceed 35 N/mm^2	4	3	5	2
	b) Compute the maximum and minimum hoop stress across the section of a pipe of 350 mm diameter and 80 mm 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.	4	3	5	2
16.	a) A reinforced concrete column of dimensions 300mm×400mm is reinforced with 4 numbers of 20 mm diameter steel bars. The column is subjected to a compressive load of 400kN. Compute the stresses in concrete and steel. Modulus of elasticity of steel is 15 times the modulus of elasticity of concrete.	4	3	2	2
	b) Sketch the shear force and bending moment diagrams for the simply supported beam shown below: 	4	4	2	2

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17.	Answer any ***two*** of the following:				
a)	An I-section is subjected to a shear force of 50kN. The top and bottom flanges have a width of 250 mm and a thickness of 25 mm while the web has a width of 25 mm and a depth of 250mm. Sketch the shear stress distribution across the cross section.	4	3	2	2
b)	A short column of rectangular cross-section is 80mm×60mm carries a load of 40kN at a point 15 mm from the longer side and 20 mm from the shorter side. Compute the maximum compressive and tensile stresses in the section.	4	3	3	2
c)	Compute the thickness of metal required for a thick cylinder of 160mm internal diameter to withstand an internal pressure of $8N/mm^2$ if the maximum hoop stress in the section is not to exceed 35 N/mm^2.	4	3	5	2

M: Marks; L: Bloom's Taxonomy Level; CO: Course Outcome; PO: Program Outcome

S. No.	Criteria for questions	Percentage
1	Fundamental knowledge (Level-1 & 2)	54
2	Knowledge on application and analysis (Level-3 & 4)	46
3	*Critical thinking and ability to design (Level-5 & 6) (*wherever applicable)	---

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