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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
FOURTH SEMESTER B.TECH DEGREE EXAMINATION, JULY 2017

Course Code: CE202

Course Name: STRUCTURAL ANALYSIS – I (CE)

Max. Marks: 100		Duration: 3 Hours

(For all problematic questions, if procedure is correct but answer is wrong, 60% credit could be given)

PART A

Answer any two full questions. Each question carries 15 marks.

1	a)	Theorem I (2 marks) Theorem II (2 marks) Sketches (1 mark)	5 marks
	b)	Support reactions: R_A= 75 KN , R_B= 25 kN (2 marks) 1 mark for each member force (1 *7 = 7 marks) Tabulation of results (1 mark)	10 marks
2	a)	Discuss Maxwell's theorem of reciprocal deflection as applied to structural systems. Theorem statement (3 marks) Sketches (2 marks)	5 marks
	b)	Expression for moment due to external load (1 marks) Expression for moment due to unit vertical load (1 marks) Expression for moment due to unit horizontal load (1 marks) Expression for strain energy/ unit load method (1 mark) Horizontal deflection = 306.67/ EI (3 marks)	10 marks

Member	Force (kN)
AD	86.60 (C)
DE	28.87 (C)
EB	28.87 (C)
BC	14.43 (T)
AC	43.30 (T)
DC	28.87 (C)
EC	28.87 (T)

<table>
<tr><td></td><td></td><td>Vertical deflection = 476.25/ EI (3 marks)</td><td></td></tr>
<tr><td>3</td><td>a)</td><td>Distinguish in terms of :
1) Primary unknowns in analysis (1 mark)
2) Use of Compatibility or equilibrium equation to solve for unknowns. (2 marks)
3) Examples(2 mark)</td><td>5 marks</td></tr>
<tr><td></td><td>b)</td><td><table><tr><td>Member</td><td>P (kN)</td><td>k (kN)</td><td>Pkl/AE</td></tr><tr><td>AB</td><td>45</td><td>0</td><td>0</td></tr><tr><td>BC</td><td>75</td><td>0</td><td>0</td></tr><tr><td>CD</td><td>45 (C)</td><td>0</td><td>0</td></tr><tr><td>DE</td><td>105 (C)</td><td>-1</td><td>280</td></tr><tr><td>DB</td><td>60 (C)</td><td>0</td><td>0</td></tr><tr><td>AD</td><td>84.84 (C)</td><td>1.414</td><td>452.55</td></tr></table>Determination of member forces due to external load (3 marks)
Determination of member forces due to unit load (3 marks)
Tabulation (2 marks)
Vertical deflection at D = 3.66 mm (2 marks)</td><td>10 marks</td></tr>
<tr><td colspan="4">PART B</td></tr>
<tr><td colspan="4">Answer any two full questions. Each question carries 15 marks.</td></tr>
<tr><td>4</td><td>a)</td><td>Steps (3 marks)
Sketches (2 marks)</td><td>5 marks</td></tr>
<tr><td></td><td>b)</td><td>Identifying redundant (2 marks)
member force (1 mark each)
Tabulation (1mark)
<table><tr><td>Member</td><td>Member Forces (kN)</td></tr><tr><td>AB</td><td>80kN (T)</td></tr><tr><td>BC</td><td>56.57kN (T)</td></tr><tr><td>CD</td><td>40kN (C)</td></tr><tr><td>DE</td><td>80kN (C)</td></tr><tr><td>AD</td><td>56.57kN (T)</td></tr><tr><td>BE</td><td>56.57kN (C)</td></tr><tr><td>BD</td><td>0 kN</td></tr></table></td><td>10 marks</td></tr>
<tr><td>5</td><td>a)</td><td>Steps (3 marks)
Sketches(2 marks)</td><td>5 marks</td></tr>
<tr><td></td><td>b)</td><td>Identifying redundant (2 marks)
Find Redundant V_B = 71.25 kN or M_A = 15kNm (5 marks)
Find the other two reactions V_A = 18.75kN (3 marks)</td><td>10 marks</td></tr>
</table>

6	a)	Construct ILD for BM at fixed support for a cantilever beam of span 'l' Diagram = 3 marks Ordinates marked = 2 marks	5 marks
	b)	Max positive shear force = 160 kN (2 marks) Max negative shear force = 166.25 kN (2 marks) Absolute max shear force = 166.25 kN (1 mark) Absolute max BM when 80 kN at 8.35 m from A. (2 marks) Absolute max BM = 651.52 kNm (3 marks)	10 marks
PART C			
Answer any two full questions. Each question carries 20 marks			
7	a)	Labelled sketch (2 marks) Functions of components (4 marks)	6 marks
	b)	V_A=50 kN , V_B= 40 kN (1 mark) T_{AB}=316.49 kN (3 marks) T_{BC}=312.67 kN (3 marks) T_{CD}=313.16 kN (3 marks) T_{DE}=315.07 kN (3 marks) Length = 201.11 m (1 mark)	14 marks
8	a)	With neat sketch, discuss the profile/shape of cable subjected to uniformly distributed load 'w' per unit horizontal length.	5 marks
	b)	Vertical reaction at supports =1200kN (1 mark) Horizontal reaction at supports = 3000kN (2 marks) Maximum tension in cable = 3231.1kN (2 marks) a) Saddle support Horizontal force on tower = zero (2.5 marks) Vertical force on tower = 2931.9 kN (2.5 marks) b) Pulley support Horizontal force on tower = 201.82 (2.5 marks) Vertical force on tower = 2815.48 kN (2.5 marks)	15 marks
9	a)	Three-hinged Arches (2marks) Two-hinged Arches (2marks) Fixed-hinged Arches (2marks)	6 marks

	b)	V_A=325 kN , V_B = 175kN (2marks) Horizontal thrust = 312.5 kN (2 marks) Radius = 29 m (2 marks) Vertical shear at D =125 kN (2 marks) Normal thrust at D= 336.43 kN(2 marks) Radial shear at D= 9.57 kN (2 marks) Bending Moment at D= 1306.25 kN (2 marks)	14 marks