Register Number:……..

KUMARAGURU
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GENERAL INSTRUCTIONS TO THE CANDIDATES

1. Candidates are instructed to answer the questions as per Bloom's Taxonomy knowledge level (K_1 to K_6)
2. Candidates are strictly instructed not to write anything in the question paper other than their roll number.
3. Candidates should search their pockets, desks and benches and handover to the Hall Superintendent/ Invigilator if any paper, book or note which they may find therein as soon as they enter the examination hall.
4. Candidates are not permitted to bring electronic watches with memory, laptop computers, personal systems, walkie-talkie sets, paging devices, mobile phones, cameras, recording systems or any other gadget / device /object that would be of unfair assistance to him / her.
5. Corrective measures as per KCT examination policies will be imposed for malpractice in the hall like copying from any papers, books or notes and attempting to elicit the answer from neighbours.

B.E DEGREE EXAMINATIONS: DEC 2015

(Regulation 2014)

Third Semester

CIVIL ENGINEERING

U14CET303: Strength of Materials-I

Time: Three Hours **Maximum Marks: 100**

Answer all the Questions:-

PART A (10 x 1 = 10 Marks)

1. Assertion (A): Tensile longitudinal stress produces compressive lateral strains CO1 [K_2]
   Reason (R): Lateral strain to longitudinal strain is known as Poisson's ratio
   a) Both A and R are true and R is the correct explanation of A
   b) Both A and R are true but R is not the correct explanation of A
   c) A is correct but R is false
   d) A is false but R is true
2. If a cantilever beam is subjected to a point load at its free end ,then the shear force under the point load is CO2 [K_2]
   a) Less than the load
   b) zero
   c) More than the load
   d) Equal to the load
3. The deflection at the free end of a cantilever of length 'L' subjected to a point load 'W' at the free end is CO3 [K_L]
   a) $WL^3/48EI$
   b) $WL^3/3EI$
   c) $WL^4/48EI$
   d) $WL^4/8EI$
4. Which of the following statements are incorrect? CO1 [K_2]
   1)Stress is directly proportional to strain within the elastic limit

2)The stress is force per unit volume

3)Hook's law holds good up to the breaking point

4)The ratio of linear stress to linear strain is called young's modulus

a) 1,3 b) 2,3

c) 1,4 d) 2,4

5. Arrange the statements given below in sequence to analyze the plane truss CO2 [K_2]

1. determine reactions at the support

2. check whether the truss is statically determinate or not

3. determine forces on each member by applying equations of equilibrium

a) 1,2,3 b) 1,3,2

c) 2,1,3 d) 2,3,1

6. Conjugate beam is an imaginary beam of length equal to that of original beam but for which load diagram is _____ diagram CO3 [K_2]

a) M /2EI b) M /3 EI

c) 2M / EI d) M / EI

7. Closed coil helical springs are also called as CO4 [K_2]

a) Compression spring b) Tension spring

c) Laminated spring d) Buffer spring

8. The strain energy stored in a shaft due to torsion is given by CO5 [K_1]

a) $\tau^2 V/2C$ b) $\tau^2 V^2/4C$

c) $\tau V/4C$ d) $\tau V^2/4C$

9. The shafts are designed on the basis of CO5 [K_2]

a) Strength b) Rigidity

c) Stress d) Both strength and Rigidity.

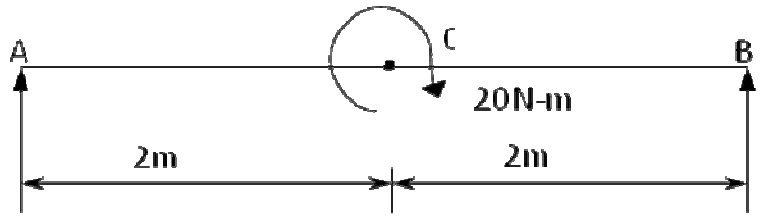
10. Match list I (load) with list II (nature of SFD and BMD) and select the correct answer by using codes given below the lists CO2 [K_2]

List I	**List II**
A. Shear force between two point loads	i.varies parabolically
B. shear force due to uniformly distributed load	ii.remains constant
C.bending moment due to uniformly distributed load	iii.varies linearly
D. bending moment due to uniformly varying load	iv. has cubic curve

	A	B	C	D
a)	i	iii	ii	iv
b)	iii	i	iv	ii
c)	ii	iii	i	iv
d)	i	iii	iv	ii

PART B (10 x 2 = 20 Marks)
(Answer not more than 40 words)

11.	The Young's modulus and the Shear modulus of material are 120GPa and 45GPa respectively. Determine its Bulk modulus.	CO1	[K_3]
12.	Define a composite bar. Explain how to determine the stresses and load carried by each member of a composite bar.	CO1	[K_3]
13.	Find the reactions at the supports of the beam given below.	CO2	[K_3]



14.	What is the advantage of method of section over method of joints? Explain how to use method of section to find forces in the members of a truss.	CO2	[K_3]
15.	Write down the equations for slope and deflection at the free end of a cantilever beam carrying uniformly distributed load W/m run over the entire span.	CO3	[K_2]
16.	Write the methods for finding the slope and deflection at a section in a loaded beam considering the loading condition and types of supports.	CO3	[K_2]
17.	List the different types of springs and explain its applications.	CO4	[K_2]
18.	A closely coiled helical spring is to carry a load of 500N. 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 80N/mm^2.Take C=8×10^4 N/mm^2.	CO4	[K_L]
19.	Write the assumptions made in the derivation of shear stress produced in a circular shaft subjected to torsion.	CO5	[K_2]
20.	A solid shaft of 20cm diameter is used to transmit torque. Find the maximum torque transmitted by the shaft if maximum shear stress induced in the shaft is 50N/mm^2	CO5	[K_3]

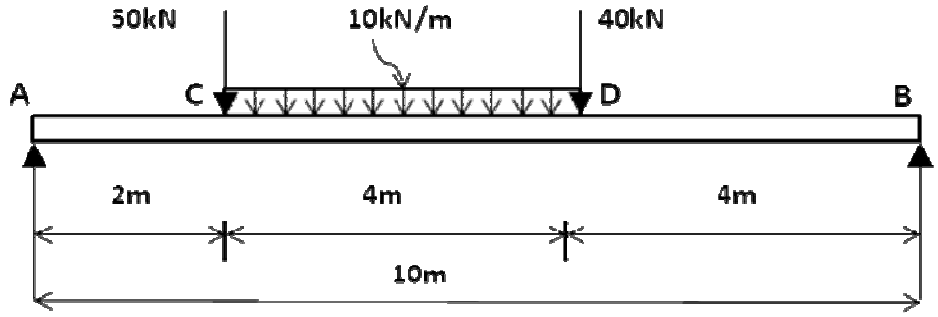
Answer any FIVE Questions:-
PART C (5 x 14 = 70 Marks)
(Answer not more than 300 words)

Q.No. 21 is Compulsory

21.	A compound tube consists of a steel tube 140mm internal diameter and 160mm external diameter and an outer brass tube 160mm internal diameter and 180mm external diameter. The two tubes are of the same length. The compound tube carries an axial load of 900kN. Find the stress and the load carried by each tube and the amount it shortens. Length of each tube is 140mm. Take E for steel as 2×10^5 N/mm^2 and for brass as 1×10^5 N/mm^2	CO1	[K_3]
22.	At a point within a body subjected to two mutually perpendicular directions, the stresses are 80N/mm^2 tensile and 40 N/mm^2 tensile. Each of the above stresses is accompanied by a shear stress of 60 N/mm^2. Determine the normal stress, shear	CO1	[K_3]

stress and resultant stress on an oblique plane inclined at an angle of 45^0 with the axis of minor tensile stress.

23. A simply supported beam of length 10m , carries a uniformly distributed load and two point loads as shown in figure below.Draw the S.F. and B.M. Diagram for the beam.Also calculate the maximum bending moment. CO2 [K_3]



24. A beam of length 6m is simply supported at its ends and carries two point loads of 48kN and 40kN at a distance of 1m and 3m respectively from the left support. Find: CO3 [K_3]
    i. Deflection under each load
    ii. Maximum deflection
    iii. The point at which maximum deflection occurs.

25. A solid cylindrical shaft is to transmit 300kW at 100 rpm. CO5 [K_3]
    (i) If the shear stress is not to exceed $80MN/m^2$, Find its diameter.
    (ii) What percentage saving in weight would be obtained if this shaft is replaced by a hollow one whose internal diameter equals 0.6 of the external diameter? The length, the material and maximum shear stress being same.

26. A closely coiled helical spring of round steel wire 10 mm in diameter having 10 complete turns with a mean diameter of 12 cm is subjected to an axial load of 200 N. Determine : (i) the deflection of the spring (ii) Maximum shear stress in the wire (iii) stiffness of the spring. Take C= 8 ×104 N/mm^2 CO4 [K_3]

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