Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Engineering

End Sem (Odd) Examination Dec-2022

RA3CO23

Strength of Materials for Mechanical Engineers

Programme: B.Tech. Branch/Specialisation: RA

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. How can be the Poissons ratio be expressed in terms of bulk modulus(K) and modulus of rigidity(G)? **1**

(a) (3K – 4G) / (6K + 4G) (b) (3K + 4G) / (6K – 4G)

(c) (3K – 2G) / (6K + 2G) (d) (3K + 2G) / (6K – 2G)

ii. What is the limiting values of Poisson's ratio? **1**

(a) -1 and 0.5 (b) -1 and -0.5

(c) -1 and -0.5 (d) 0 and 0.5

iii. Shear force is unbalanced _____ to the left or right of the section. **1**

(a) Horizontal force (b) Vertical force

(c) Inclined force (d) Conditional force

iv. Shear force is diagram of _____ representation of shear force plotted as ordinate. **1**

(a) Scalar (b) Aerial

(c) Graphical (d) Statically

v. Torsional sectional modulus is also known as _____. **1**

(a) Polar modulus (b) Sectional modulus

(c) Torsion modulus (d) Torsional rigidity

vi. Calculate the torque which a shaft of 300 mm diameter can safely transmit, if the shear stress is 48 N / mm^2. **1**

(a) 356 kNm (b) 254 kNm (c) 332 kNm (d) 564 kNm

vii. Units of deflection are _____. **1**

(a) kNm (b) kN/m (c) kN (d) m

P.T.O.

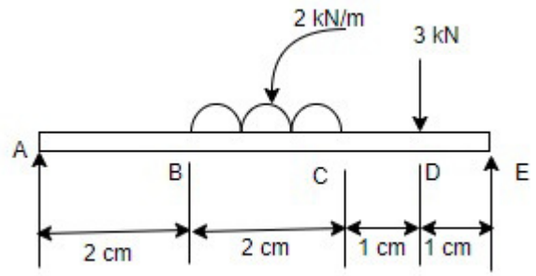
viii. In simply supported beams, deflection is zero at _____. **1**
(a) Mid span (b) Supports
(c) Throughout (d) Point of action of load

ix. The stress acts tangential to circumference is called _____ stress. **1**
(a) Hoop (b) Fluid
(c) Longitudinal (d) Yield

x. _____ is half the circumferential stress. **1**
(a) Hoop stress (b) Longitudinal stress
(c) Fluid stress (d) Transverse stress

Q.2 i. Define the thermal stress. **2**
ii. Explain the volumetric strain **3**
iii. Derive the expression for extension of a bar due to self load. **5**
OR iv. Derive the relationship between elastic constants. **5**

Q.3 i. Explain the point of contra flexture. **4**
ii. Derive the relationship between shear force & bending moment. **6**
OR iii. Draw the shear force diagram and bending moment diagram of above beam. **6**



Q.4 Attempt any two:
i. Explain the torsional rigidity. **5**
ii. Derive the torsion equation. **5**
iii. For a Helical compression spring (H.C.S), subjected to a Max. force of 1250 N. The deflection of spring corresponding to Max. force should be approximate 30 mm. The Spring Index(C)=6. spring made of patented and cold drawn steel wire of Grade1. **5**

The constants (A=1753, m=0.182, G=81370 N/mm^2) given as shown. Permissible Shear stress for spring wire taken as 50% of the Ultimate tensile strength (S_{ut}). Find The following;
(a) Wire diameter (d) (b) Mean Coil diameter (D)

Q.5 i. Explain the double integral method. **4**
ii. Describe the Macaulay's method for deflection of beams. **6**
OR iii. Describe the area moment method for determining of deflection of beams. **6**

Q.6 Attempt any two:
i. Describe the lames theorem. **5**
ii. What are hoop stress and longitudinal stress of a thin shell? **5**
iii. Discuss the deformation in thin and thick cylinders. **5**

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Marking Scheme
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Q.1	i.	(c) (3K – 2G) / (6K + 2G)	1 Mark	**1**
	ii.	(d) 0 and 0.5	1 Mark	**1**
	iii.	(b) Vertical force	1 Mark	**1**
	iv.	(c) Graphical	1 Mark	**1**
	v.	(a) Polar modulus	1 Mark	**1**
	vi.	(b) 254 kNm	1 Mark	**1**
	vii.	(d) m	1 Mark	**1**
	viii.	(b) Supports	1 Mark	**1**
	ix.	(a) Hoop	1 Mark	**1**
	x.	(b) Longitudinal stress	1 Mark	**1**
Q.2	i.	Definition	1 Mark	**2**
		Diagram	1 Mark	
	ii.	Explanation	1 Mark	**3**
		Expression	2 Marks	
	iii.	Diagram	1 Mark	**5**
		As per the attempt	4 Marks	
OR	iv.	As per the attempt	5 Marks	**5**
Q.3	i.	Definition	2 Marks	**4**
		Diagram	2 Marks	
	ii.	As per the attempt	6 Marks	**6**
OR	iii.	Value shear force	1 Mark	**6**
		Diagram	2 Marks	
		Value of bending moment	1 Mark	
		Diagram	2 Marks	
Q.4		Attempt any two:		
	i.	Explanation	2 Marks	**5**
		Expression	3 Marks	
	ii.	Condition	2 Marks	**5**
		Expression	3 Marks	
	iii.	(a) Wire diameter (d)	3 Marks	**5**
		(b) Mean Coil diameter (D)	2 Marks	
Q.5	i.	Normal expression	1 Mark	**4**
		Single integration	2 Marks	
		Double integration	1 Marks	
	ii.	Diagram	1 Mark	**6**
		Moment equation	1 Mark	
		Constant value	2 Marks	
		Slope	1 Mark	
		Deflection	1 Marks	
OR	iii.	Diagram	1 Mark	**6**
		Bending moment diagram	1 Mark	
		$B.M/E_I$ diagram	2 Marks	
		Deflection	2 Marks	
Q.6		Attempt any two:		
	i.	Condition	2 Marks	**5**
		Statement	3 Marks	
	ii.	Hoop stress	2.5 Marks	**5**
		Longitudinal stress	2.5 Marks	
	iii.	Thin cylinders	2.5 Marks	**5**
		Thick cylinders.	2.5 Marks	

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