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Reg No.: _____

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APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY
Sixth Semester B.Tech Degree (S, FE) Examination May 2023 (2015 Scheme)



Course Code: MR 306

Course Name: MECHANICS OF SOLIDS

Max. Marks: 100

Duration: 3 Hours

PART A

Answer all questions, each carries 5 marks.

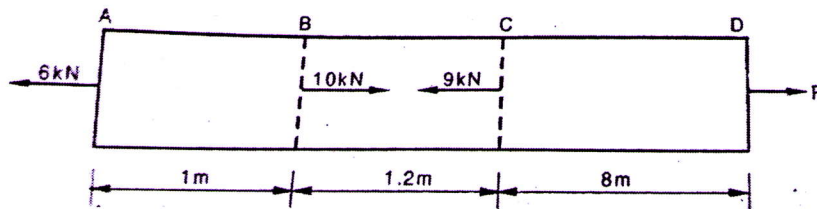
- 1 Discuss about shear stress with a simple figure? 5
- 2 Enumerate about the principle of superposition? 5
- 3 A circular shaft of 100mm diameter is required to transmit torque. Find the shaft torque if the shear stress is not to exceed 85 MPa? 5
- 4 Discuss about bending stress and with the help of a neat diagram show its distribution in a shaft? 5
- 5 What are the various types of supports and give their reaction at support? 5
- 6 Explain about the sign conventions used in SFD and BMD 5
- 7 Name any two types of spring and explain their uses? 5
- 8 Define helical spring. Name the two important types of helical springs 5

PART B

Answer any three questions, each carries 10 marks.

- 9 a) Sketch the stress – strain curve for a ductile material and mark the salient points on it. 4
- b) A load of 4kN has to be raised at the end of a steel wire .if the unit stress in the wire must not exceed 80N/mm^2 , What is the minimum diameter required? What will be extension of 3.50 m length of wire? Take $E = 2 \times 10^5\text{N/mm}^2$ 6
- 10 a) Derive the relation between young's modulus and bulk modulus 5
- b) If the values of modulus of elasticity and poisson's ratio for an alloy body are 150Gpa and 0.25 respectively. Determine the value of bulk modulus for the alloy? 5
- 11 Elucidate the concept of torsion and derive torsional equations 10
- 12 a) Derive an expression for bending stress at a layer in a beam 5
- b) State the assumptions in the theory of pure bending 5

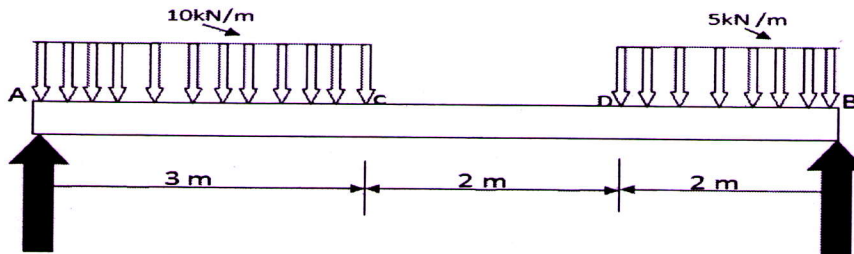
- 13 A steel member ABCD of uniform cross section area 1000 mm^2 is subjected to axial force as shown. Calculate the force P required for equilibrium of the member and determine the change in length of member. 10



PART C

Answer any two questions, each carries 15 marks.

- 14 A simply supported beam of span 5m is subjected to UDL of 10 kN/m over 3m length from the left end. In addition it carries a downward load of 20 kN at 1m from the right end. Draw the SFD and BMD for the beam indicating the important values 15
- 15 a) Draw SFD and BMD of a simply supported beam of length 7 m carrying UDL as shown in figure. 10



- b) Define the terms shear force, bending moment and point of contra flexure 5
- 16 a) Determine the number of plates required to enable the spring to carry a central point load of 4 kN and also find out the deflection under the load? 10
- It is given that the spring 2m long is made up of plates each 10 cm wide and 2 cm thick and the bending stress in the plate is limited to 200 N/mm^2 .
- Take $E = 2.1 \times 10^5 \text{ N/mm}^2$,
- b) Discuss about slenderness ratio 5
- 17 a) Derive the expression for deflection of helical spring 10
- b) Elucidate nipping in leaf springs 5
