Total No. of printed pages = 5

END SEMESTER EXAMINATION, 2020

Semester : 4th (Diploma)

Subject Code : BES-402

STRENGTH OF MATERIALS

Full Marks – 70

Time – Three hours

The figures in the margin indcate full marks
for the questions.

Instructions :

1. Questions of PART–A are compulsory.

2. Answer any *five* questions from PART–B.

PART – A

Marks – 25

1. Choose the correct or most appropriate option(s).
   1×5=5

   (i) The unit of stress is

   (a) N   (b) N/m^2

   (c) mm   (d) no unit

   [Turn over

(ii) The change in length due to tensile or compressive force acting on a body is given by

(a) $\dfrac{PlA}{E}$ (b) $\dfrac{Pl}{AE}$

(c) $\dfrac{E}{PlA}$ (d) $\dfrac{AE}{Pl}$

Where P = Tensile or compressive force

l = Original length of the body

A = Cross-sectional area of the body

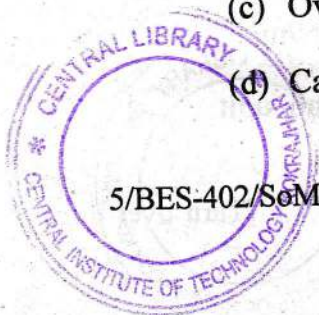E = Young's modulus for the material of the body.

(iii) A beam which is fixed at one end and free at the other is called

(a) Simply supported beam

(b) Fixed beam

(c) Overhanging beam

(d) Cantilever beam

5/BES-402/SoM   (2)

(iv) Within elastic limit, shear stress is

(a) equal to shear strain

(b) less than shear strain

(c) directly proportional to shear strain

(d) inversely proportional to shear strain

(v) When a shaft is subjected to twisting moment, every cross-section of the shaft will be under

(a) tensile stress

(b) compressive stress

(c) shear stress

(d) bending stress.

2. Fill up the blanks : $1 \times 5 = 5$

(i) SI unit of force is _____.

(ii) Torque transmitted by a hollow circular shaft, T = _____.

(iii) Shear stress, τ = _____.

(iv) Poisson's ratio, μ = _____.
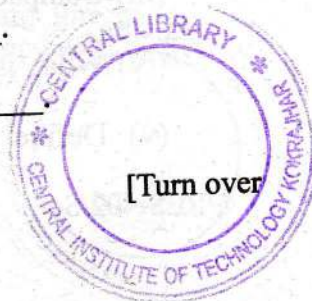
(v) A beam which is fixed at both ends is called
_____.

3. Write true or false : 1×5=5

(i) Within elastic stage, the resisting force equals to applied load.

(ii) A beam which is provided more than two supports is known as continuous beam.

(iii) The bending moment at a point on a beam is the algebraic sum of all the moments on either side of the point.

(iv) The unit of Young's modulus is same as that of stress.

(v) Maximum power transmitted by a circular solid shaft, $P = 2\pi N/60$ (Watt).

4. Answer the following questions : 1×10=10

(i) Define strength of materials.

(ii) Define Longitudinal strain.
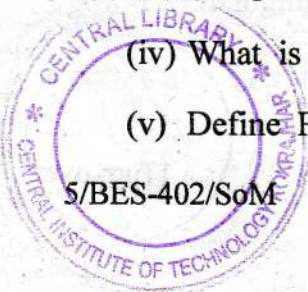
(iii) Compare tensile and compressive stress.

(iv) What is UVL ?

(v) Define Principal stress.

5/BES-402/SoM (4) 50(W)

(vi) What is Pure bending ?

(vii) What is shear force diagram ?

(viii) Define Modulus of rigidity.

(ix) Define factor of safety.
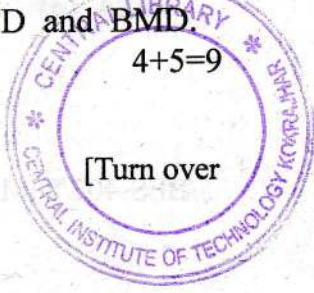
(x) What is Polar Modulus ?

PART – B

Marks – 45

1. Define Stress-Strain diagram. Explain with suitable diagram. What are the properties that can be obtained from Tensile test.   3+6=9

2. What are the assumptions made during the analysis of Bending equation ? Derive the Bending equation.   4+5=9

3. What are the assumptions made during the analysis of Torsion equation ? Derive the Torsion equation.   4+5=9

4. A simply supported beam has a span of 11m and carries three point loads of 20 kN, 10 kN and 15 kN at a distance 3m, 5m and 9m from left side of the beam. Draw the SFD and BMD.   4+5=9

5. Determine stress, strain and Young's modulus of a brass rod of diameter 30 mm and of length 300 mm which is subjected to a tensile load of 60 kN when the extension of the rod is equal to 0.4mm. 3×3=9

6. Determine the diameter of a solid steel shaft which will transmit 100 kW at 150 rpm. Also determine the length of the shaft of the twist must not exceed 1° over the entire length. The maximum shear stress is limited to 60 N/mm². Take the value of modulus of rigidity = 8×10^4 N/mm². 4½×2=9