Total No. of printed pages = 7

RETEST EXAMINATION - 2019

Semester : 4th

Subject Code : BES-402

STRENGTH OF MATERIALS

Full Marks – 70

Time – Three hours

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

Instructions :

1. *All* 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) 1 N is equal to

(a) $1\ kg \times 1\ m/s^2$ (b) $1\ g \times 1\ cm/s^2$

(c) $1\ kg \times 1\ m$ (d) $1\ g \times 1\ cm$

[Turn over

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

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

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

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) Shear stress is the stress which acts

(a) perpendicular to the area

(b) tangential to the area

(c) inclined to the area

(d) All of the above

(iv) A beam whose both ends are fixed is known as

(a) simply supported beam

(b) overhanging beam

(c) fixed beam

(d) cantilever beam

(v) When shear force at a point is zero, then moment is

(a) zero at that point

(b) minimum at that point

(c) maximum at that point

(d) infinity at that point

2. Fill up the blanks : 1×5=5

(i) Strain, $e = \frac{\cdots\cdots}{\cdots\cdots}$.

(ii) Torque transmitted by a solid circular shaft = ________.

(iii) ______ load is one which is considered to act at a point.

(iv) The polar moment of inertia of a solid circular shaft of diameter (D) is _____.

(v) ______ at a point on a beam is the algebraic sum of all the moments on either side of the point.

3. Write true or false : $1\times5=5$

(i) At the neutral axis of a beam, the shear stress is zero.

(ii) Hook's law holds good up to plastic limit.

(iii) The shear force at a point on a beam is the algebraic sum of all the forces 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 : $1\times10=10$

(i) Define shear stress.

(ii) What is modulus of rigidity ?

(iii) Define bending moment on a beam.

(iv) What is point of contraflexure ?

(v) What is proportional limit in stress-strain diagram ?

(vi) What is Bending stress ?

(vii) Define shear force diagram.

(viii) Define principal stress and strain.

(ix) What is Torsion ?

(x) What is Section Modulus ?

PART – B

Marks – 45

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

2. What is stress-strain diagram ? Explain with diagram. What are the properties that can be obtained from tension test ? Explain. 5+4=9

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

4. A simply supported beam has a span of 7m and carries three point loads of 11 kN, 22kN and 9 kN at a distance 2m, 3m and 5m from left side of the beam. Draw the SFD and BMD. 4+5=9

5. A tensile test was conducted on a mild steel bar. The following data were obtained from the test :

(i) Diameter of the steel bar = 3 cm

(ii) Gauge length of the bar = 20 cm

(iii) Load at elastic limit = 250 kN

(iv) Extension at a load of 150 kN = 0.21 mm

(v) Maximum load = 380 kN

(vi) Total extension = 60 mm

Determine : (a) the Young's modulus, (b) the stress at elastic limit, (c) the percentage elongation. 3×3=9

6. (a) A solid shaft of 150 mm diameter i
to transmit torque. Find the maximum
transmitted by the shaft if the maximun
stress induced to the shaft is 60 N/n

(b) Calculate the maximum stress induce
cast iron pipe of external diameter 40r
internal diameter 20 mm and lengt
when the pipe is supported at its en
carries a point load of 70N at its c