Time : 3 hours]   [*Total Marks* : 80

PART—A   3×10=30

Instructions : (1) Answer **all** questions.

          (2) Each question carries **three** marks.

          (3) Answers should be brief and straight to the point and shall not exceed *five* simple sentences.

1. Define *(a)* stress, and *(b)* strain.   1½+1½

2. A steel rod 20 mm diameter and 600 mm long is subjected to an axial pull of 40 kN. Determine the elongation of the rod if $E = 2 \times 10^5 \, N/mm^2$.

3. Write any three assumptions made in deriving the torsion equation.

4. A solid shaft is to transmit 350 kW and 110 r.p.m.,if the maximum shear stress induced must not exceed $90 \, N/mm^2$. Find the diameter of the shaft.

5. Write down the classification of IC engines.

6. State the function of a carburetor.

7. List out any six important boiler mountings.

8. State any three advantages of gas turbine over IC engines.

9. What are the differences between single-stage and multi-stage centrifugal pumps?

10. Write down the classification of lubricants.

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PART—B   10×5=50

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Instructions : (1) Answer *any* **five** questions.

                   (2) Each question carries **ten** marks.

                   (3) Answers should be comprehensive and the criterion for valuation is the content but not the length of the answer.

11. The following readings are obtained from a tensile test of a specimen :

Diameter of the specimen = 20 mm

Gauge length = 100 mm

Extension at a load of 100 kN = 0 15 mm

Load at yield point = 120 kN

Maximum load = 200 kN

Final length = 170 mm

Diameter of neck = 12 6 mm

Calculate—

(a) Young's modulus;

(b) stress at yield point;

(c) % elongation;

(d) % reduction in area;

(e) working stress taking factor of safety 3.

12. A bar of 16 mm diameter is subjected to a pull of 27 kN. The measured extension over gauge length of 80 mm is 0 12 mm and the change in diameter is 0 007 mm. Find the Poisson's ratio and the modulus of elasticity.

13. A solid steel shaft 50 mm diameter transmits power at 75 r.p.m. if the maximum allowable shear stress in it is $40\,\text{N}/\text{mm}^2$.

Calculate—

(a) angle of twist per meter length of shaft when G $80\,\text{kN}/\text{mm}^2$;

(b) the value of shear stress at a radial distance of 10 mm from the centre.

14. Explain the working principle of 4-stroke diesel engine with neat sketch.

15. Describe the working of any one type water-tube boiler with a neat sketch.

16. Draw a neat sketch of constant pressure gas turbine and explain its working principle.

17. Explain the working of Kaplan turbine with a neat sketch.

18. Draw a simple sketch showing the installation of a centrifugal pump indicating various components and hydraulic heads.

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