



P.E.S. College of Engineering, Mandya - 571 401
 (An Autonomous Institution affiliated to VTU, Belagavi)
Fifth Semester, B.E. - Mechanical Engineering
Semester End Examination; Feb. - 2021

Problem Solving Skill for Competitive Examinations (Technical Skills - I)

Time: 2 hr.

Max. Marks: 50

Course Outcomes

The Students will be able to:

CO1: Show the performance in competitive examinations.

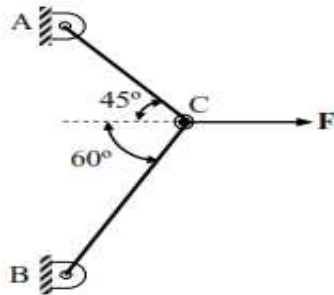
CO2: Apply the technical skill to attend all kind of competitive examinations.

CO3: Develop the knowledge to solve real problems.

Note: All questions are compulsory and each question carries TWO marks.

Q. No.	Questions	BLs	COs	POs	
1.	Maximum fluctuation of K.E in an engine has been calculated to be 2600 J. Assuming that the engine runs at an average speed of 200 rpm, the polar mass moment of inertia (in kg-m ²) of a flywheel to keep the speed fluctuation within $\pm 0.5\%$ of the average speed is_____ <p>(A) 0529.63 (B) 569.63 (C) 600.30 (D) 592.73</p>		L3	CO1	PO1,2
2.	The angle between the direction of the follower motion and a normal to the pitch curve is called_____ <p>(A) Pitch angle (B) Cam angle (C) Pressure angle (D) Dwell angle</p>		L1	CO1	PO1
3.	The state of stress at a point, for a body in plane stress, is shown in Figure below. If the minimum principal stress is 10 KPa, then the normal stress σ_y (in KPa) is_____ <div style="text-align: center; margin: 10px 0;"> <p>The diagram shows a square element in a state of plane stress. On the right face, a normal stress $\sigma_x = 100 \text{ KPa}$ acts to the right. On the top face, a shear stress $\tau_{xy} = 50 \text{ KPa}$ acts downwards. On the left face, a normal stress σ_y acts to the left. On the bottom face, a shear stress $\tau_{yx} = 50 \text{ KPa}$ acts upwards.</p> </div> <p>(A) 41.38 (B) 18.38 (C) 72.36 (D) 37.78</p>		L3	CO1	PO1,2
4.	If the Young's modulus of elasticity of a material is twice it's modulus of rigidity, then the Poisson's ratio of the material is_____ <p>(A) $\mu = 1$ (B) $\mu = 0$ (C) $\mu = 1.23$ (D) $\mu = 3$</p>		L2	CO1	PO1,2

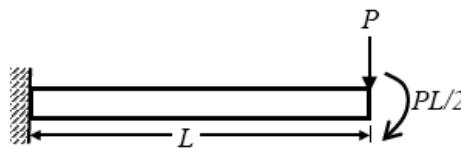
5. Two steel truss members, AC and BC, each having cross sectional area of 100 mm^2 , are subjected to a horizontal force F as shown in figure. All the joints are hinged. If $F = 1 \text{ kN}$, the magnitude of the vertical reaction force developed at the point B in kN is _____



L3 CO1 PO1,2

- (A) 0.63 (B) 3.23 (C) 0.99 (D) 0.12

6. The flexural rigidity (EI) of a cantilever beam is assumed to be constant over the length of the beam shown in figure. If a load P and bending moment $PL/2$ are applied at the free end of the beam then the value of the slope at the free end is _____



L3 CO2 PO1,2

- (A) $\frac{PL^2}{EI}$ (B) $\frac{3PL^2}{2EI}$ (C) $\frac{5PL^2}{2EI}$ (D) $\frac{1PL^2}{2EI}$

7. A mass m_1 of 100 kg travelling with a uniform velocity of 5 m/s along a line collides with a stationary mass m_2 of 1000 kg . After the collision, both the masses travel together with the same velocity. The coefficient of restitution is _____

L3 CO1 PO1,2

- (A) 0.1 (B) 0.03 (C) 0.3 (D) 0

8. A solid circular shaft of 60 mm diameter transmits a torque of 1600 N-m . The value of maximum shear stress developed is _____

L3 CO1 PO1,2

- (A) 37.72 MPa (B) 47.72 MPa (C) 57.72 MPa (D) 67.72 MPa

9. When can a Piezometer be not used for pressure measurement in pipes?

- (A) The pressure difference is low
 (B) The velocity is high
 (C) The fluid in the pipe is a gas
 (D) The fluid in the pipe is highly viscous

L1 CO2 PO1

10. For laminar flow over a flat plate, the thickness of the boundary layer at a distance from the leading edge is found to be 5 mm . Thickness of the boundary layer at a downstream section which is at twice the distance of the previous section from the leading edge will be _____

L3 CO2 PO1,2

- (A) 10 mm (B) $2\sqrt{5} \text{ mm}$ (C) $5\sqrt{2} \text{ mm}$ (D) 2.5 mm

11. A wooden rectangular block of length L is made to float in water with its axis vertical. The center of gravity of the floating body is 0.15 L above the center of buoyancy. What is the Specific gravity of the wooden block? L2 CO2 PO1,2
 (A) 0.6 (B) 0.65 (C) 0.7 (D) 0.75
12. Navier–Stokes equation represents the conservation of _____ L1 CO2 PO1,2
 (A) Energy (B) Mass (C) Pressure (D) Momentum
13. A 2 kW, 40 liter water heater is switched on for 20 min. The heat capacity cp for water is 4.2 kJ/kg °K. Assuming all the electrical energy has gone into heating the water, increase of the water temperature in degree centigrade is _____ L3 CO2 PO1
 (A) 2.7 (B) 4.0 (C) 14.3 (D) 25.25
14. A Carnot engine receiving heat at 400 K has an efficiency of 24%. The COP of a Carnot refrigerator working between the same temperature limit is _____ L3 CO2 PO1,2
 (A) 1 (B) 2 (C) 3 (D) 4
15. Which one of the following thermodynamic processes approximates the steaming of food in a pressure cooker? L1 CO2 PO1
 (A) Isenthalpic (B) Isobaric (C) Isochoric (D) isothermal
16. The heat absorbed or rejected during a polytropic process is equal to L2 CO2 PO1
 (A) $\sqrt{((\gamma-n)/(\gamma-1))} \times \text{work done}$ (B) $((\gamma-n)/(\gamma-1)) \times \text{work done}$
 (C) $((\gamma-1)/(\gamma-n)) \times \text{work done}$ (D) $((\gamma-n)^2 / (\gamma-1)^2) \times \text{work done}$
17. Match List I with List II and select the correct
- | List I (Heat treatment) | List II (Effects) | |
|--------------------------------|--------------------------------------------|------------|
| P. Annealing | 1. Refines grain structure | |
| Q. Nitriding | 2. Improves the hardness of the whole mass | |
| R. Martempering | 3. Increases surface hardness | L1 CO3 PO1 |
| S. Normalizing | 4. Improves ductility | |
| (A) P-4, Q-3, R-2, S-1 | (B) P-1, Q-3, R-4, S-1 | |
| (C) P-4, Q-2, R-1, S-3 | (D) P-2, Q-1, R-3, S-4 | |
18. A loose piece pattern is used for L2 CO3 PO1
 (A) Making intricate shapes where removal of all portions of the pattern is not possible
 (B) Large and axis symmetrical castings
 (C) Large scale continuous production in machine moldings
 (D) Intricate castings split at parting line.
19. Light impurities in centrifugal castings are L1 CO3 PO1
 (A) Collected at outer surface (B) Collected at inner surface
 (C) Mixed uniformly throughout the casting (D) Thrown away as slug

20. For a ductile material, toughness is the measure of
- (A) Resistance to scratching
 (B) Ability to absorb energy up to fracture
 (C) Ability to absorb energy till elastic limit
 (D) Resistance to indentation
- L1 CO3 PO1
21. A 2 mm thick metal sheet is to be bent at an angle of one radian with a bend radius of 100 mm. If the stretch factor is 0.5, the bend allowance is
- (A) 99 mm
 (B) 100 mm
 (C) 101 mm
 (D) 102 mm
- L3 CO3 PO1,2
22. Match the correct combination for following metal working processes.
- | Process | Stress | |
|--------------------|----------------------------|------------|
| P. Blanking | 1. Tension | |
| Q. Stretch forming | 2. Compression | |
| R. Coning | 3. Shear | |
| S. Deep drawing | 4. Tension and compression | L1 CO3 PO1 |
| | 5. Tension and shear | |
- (A) P-2, Q-1, R-3, S-4
 (B) P-3, Q-4, R-1, S-5
 (C) P-5, Q-4, R-3, S-1
 (D) P-3, Q-1, R-2, S-4
23. Plastic deformation is always followed by elastic recovery upon removal of the load. In bending, this recovery is known as
- (A) Wrinkling
 (B) Spring back
 (C) Lancing
 (D) all of the above
- L1 CO3 PO1
24. The mechanism of material removal in EDM process is
- (A) Melting and evaporation
 (B) Melting and corrosion
 (C) Erosion and cavitations
 (D) Cavitations and evaporation
- L1 CO3 PO1
25. Friction at the tool-chip interface can be reduced by
- (A) Decreasing the rake angle
 (B) Increasing the depth of cut
 (C) Decreasing the cutting speed
 (D) Increasing the cutting speed
- L1 CO3 PO1

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