

# Answer Key :ME

Type: ME

1) If the surface tension of water–air interface is  $0.073 \text{ N/m}$ , the gauge pressure inside a raindrop of  $1 \text{ mm}$  diameter will be:

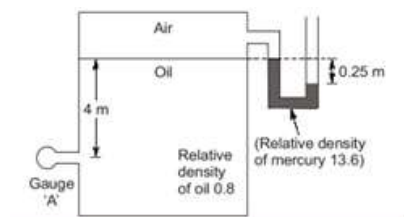
Options:

- 1.a)  $0.146 \text{ N/m}^2$
- 2.b)  $73 \text{ N/m}^2$
- 3.c)  $146 \text{ N/m}^2$
- 4.d)  $292 \text{ N/m}^2$

Correct Option: 4

Type: ME

2) The reading of gauge A shown in figure is



Options:

- 1.a)  $-31.392 \text{ kPa}$
- 2.b)  $-1.962 \text{ kPa}$
- 3.c)  $31.392 \text{ kPa}$
- 4.d)  $+19.62 \text{ kPa}$

Correct Option: 2

Type: ME

3) The height of a cylindrical container is twice that of its diameter. The ratio of the horizontal forces on the wall of the cylinder when it is completely filled to that when it is half filled with the same liquid is

Options:

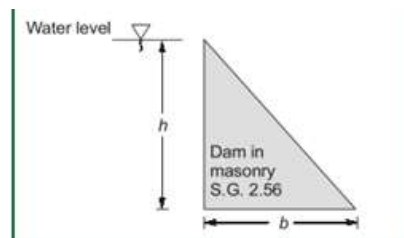
- 1.a) 2
- 2.b) 3
- 3.c) 3.5

- 4.d) 4

**Correct Option:** 4

**Type:** ME

4) A triangular dam of height  $h$  and base width  $b$  is filled to its top with water as shown in the figure given. The condition of stability is



**Options:**

- 1.a)  $b=h$
- 2.b)  $b=2.6h$
- 3.c)  $b=0.577h$
- 4.d)  $b=0.625h$

**Correct Option:** 4

**Type:** ME

5) The area of a 2 m long tapered duct decreases as  $A=(0.5-0.2x)$  where 'x' is the distance in meters. At a given instant a discharge of  $0.5 \text{ m}^3/\text{s}$  is flowing in the duct and is found to increase at a rate of  $0.2 \text{ m}^3/\text{s}$ . The local acceleration (in  $\text{m}/\text{s}^2$ ) at  $x=0$  will be

**Options:**

- 1.a) 1.4
- 2.b) 1
- 3.c) 0.4
- 4.d) 0.667

**Correct Option:** 3

**Type:** ME

6) The value of friction factor is misjudged by +25% in using Darcy-Weisbach equation. The resulting error in the discharge will be

**Options:**

- 1.a) +25%
- 2.b) -18.25%
- 3.c) -12.5%
- 4.d) +12.5%

**Correct Option: 3**

**Type: ME**

**7) The eye of a tornado has a radius of 40 m. If the maximum wind velocity is 50 m/s, the velocity at a distance of 80 m radius is**

**Options:**

- 1.a) 100 m/s
- 2.b) 2500 m/s
- 3.c) 31.25 m/s
- 4.d) 25 m/s

**Correct Option: 4**

**Type: ME**

**8) The internal energy of certain system is a function of temperature alone and is given by the formula  $E = 25 + 0.25$  kJ. If this system executes a process for which the work done by it per degree temperature increase is 0.75 kNm, the heat interaction per degree temperature increase, in**

**Options:**

- 1.a) -1
- 2.b) -0.5
- 3.c) 0.5
- 4.d) 1

**Correct Option: 4**

**Type: ME**

**9) A system of 100 kg mass undergoes a process in which its specific entropy increases from 0.3 kJ/kg·K to 0.4 kJ/kg·K. At the same time, the entropy of the surroundings decreases from 80 kJ/K to 75 kJ/K. The process is**

**Options:**

- 1.a) Reversible and isothermal
- 2.b) Irreversible
- 3.c) Reversible
- 4.d) Impossible

**Correct Option: 2**

**Type: ME**

**10) A heat engine receives 1000 kW of heat at a constant temperature of 285°C and rejects 492 kW of heat at 5°C. Consider the following thermodynamic cycles in this regard: 1. Carnot cycle 2. Reversible cycle 3. Irreversible cycle Which of these cycles could possibly be executed by the engine?**

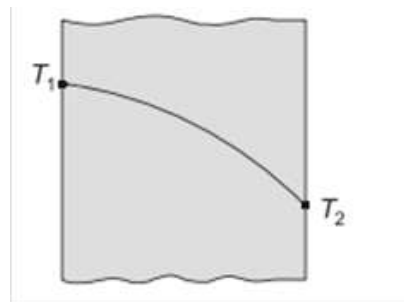
**Options:**

- 1.a) 1 only
- 2.b) 3 only
- 3.c) 1 and 2
- 4.d) None of 1,2,3

**Correct Option: 4**

**Type: ME**

**11) In a large plate, the steady temperature distribution is as shown in the figure below. If no heat is generated in the plate, the thermal conductivity  $k$  will vary as ( $T$  is temperature and  $\alpha$  is a constant)**



**Options:**

- 1.  $k(1+\alpha T)$
- 2.  $k(1-\alpha T)$
- 3.  $k+\alpha T$
- 4.  $k-\alpha T$

**Correct Option: 1**

Type: ME

12) A solid copper ball of mass 500 grams, when quenched in a water bath at  $30^{\circ}\text{C}$ , cools from  $530^{\circ}\text{C}$  to  $430^{\circ}\text{C}$  in 10 seconds. What will be the temperature of the ball after the next 10 seconds?

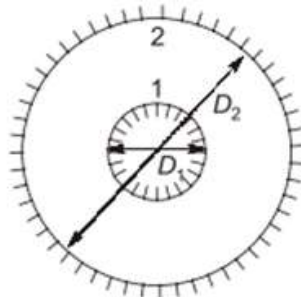
Options:

- 1.a)  $300^{\circ}\text{C}$
- 2.b)  $320^{\circ}\text{C}$
- 3.c)  $350^{\circ}\text{C}$
- 4.d) None of the above

Correct Option: 3

Type: ME

13) Consider two infinitely long blackbody concentric cylinders with a diameter ratio  $D_2/D_1=3$ . The shape factor for the outer cylinder with itself will be



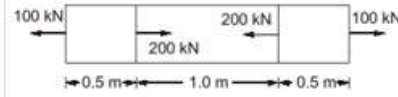
Options:

- 1.a) 0
- 2.b)  $1/3$
- 3.c)  $2/3$
- 4.d) 1

Correct Option: 3

Type: ME

14) A slender bar of  $100\text{ mm}^2$  cross-section is subjected to loading as shown in the figure. If the modulus of elasticity is taken as  $200 \times 10^9\text{ Pa}$ , then the elongation produced in the bar will be



**Options:**

- 1.a) 10 mm
- 2.b) 5 mm
- 3.c) 1 mm
- 4.d) Nil

**Correct Option: 4**

**Type: ME**

**15) When a thin cylinder of diameter 'd' and thickness 't' is pressurized with an internal pressure of 'p' ( $1/m$  is the Poisson's ratio and E is the modulus of elasticity), then out of the following, which statement is correct**

**Options:**

- 1.a) The circumferential strain will be equal to  $(pd/2tE) * (0.5 - (1/m))$
- 2.b) The longitudinal stress will be equal to  $(pd/2tE) * (1 - (1/2m))$
- 3.c) The longitudinal stress will be equal to  $pd/2t$
- 4.d) The ratio of the longitudinal strain to circumferential strain will be equal to  $(m-2)/(2m-1)$

**Correct Option: 4**

**Type: ME**

**16) A cantilever beam having 5 m length is so loaded that it develops a shearing force of 20 T and a bending moment of 20 T-m at a section 2 m from the free end. Maximum shearing force and maximum bending moment developed in the beam under this load, are respectively 50 T and 125 T-m. The load on the beam is**

**Options:**

- 1.a) 25 T concentrated load at free end
- 2.b) 20 T concentrated load at free end
- 3.c) 5 T concentrated load at free end 2 T/m load over entire length
- 4.d) 10 T/m UDL over entire length

**Correct Option: 4**

**Type: ME**

**17) Two hollow shafts of the same material have the same length and outside diameter. Shaft 1 has internal diameter equal to one third of the outer diameter and shaft 2 has internal diameter equal to half of the outer diameter. If both the shafts are subjected to the same torque, the ratio of their twists  $\mu_1/\mu_2$  will be equal to**

**Options:**

- 1.a) 16/81
- 2.b) 8/27
- 3.c) 19/27
- 4.d) 243/256

**Correct Option: 4**

**Type: ME**

**18) If diameter of a long column is reduced by 20%, the percentage of reduction in Euler buckling**

**Options:**

- 1.a) 4
- 2.b) 36
- 3.c) 49
- 4.d) 59

**Correct Option: 4**

**Type: ME**

**19) When a weight of 100 N falls on a spring of stiffness 1 kN/m from a height of 2 m, the deflection caused in the first fall is**

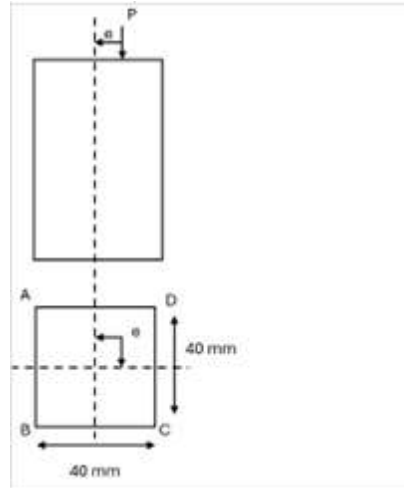
**Options:**

- 1.a) equal to 0.1 m
- 2.b) between 0.1 m to 0.2 m
- 3.c) equal to 0.2 m
- 4.d) more than 0.2 m

**Correct Option: 4**

Type: ME

20) A column of square section 40 mm x 40 mm, fixed to the ground carries an eccentric load  $P$  of 1600 N as shown in the figure. If the stress developed along the edge CD is  $-1.2$  N/mm<sup>2</sup>, the stress along the edge AB will be



Options:

- 1.a)  $-1.2$  N/mm<sup>2</sup>
- 2.b)  $+1$  N/mm<sup>2</sup>
- 3.c)  $-0.8$  N/mm<sup>2</sup>
- 4.d)  $+0.8$  N/mm<sup>2</sup>

Correct Option: 3

Type: ME

21) The maximum efficiency of self locking screw is

Options:

- 1.a) 50%
- 2.b) 70%
- 3.c) 75%
- 4.d) 80%

Correct Option: 1

Type: ME

22) Two closed coil springs are made from the same small diameter wire, one wound on 2.5 cm diameter core and the other on 1.25 cm diameter core. If each spring had 'n' coils, then the ratio of their spring constants would be

**Options:**

- 1.a) 1/16
- 2.b) 1/8
- 3.c) 1/4
- 4.d) 1/2

**Correct Option: 2**

**Type: ME**

**23) A spherical drop of molten metal of radius 2mm was found to solidify in 10 seconds. A similar drop of radius 4mm would solidify in**

**Options:**

- 1.a) 14.14 sec
- 2.b) 20 sec
- 3.c) 18.30 sec
- 4.d) 40 sec

**Correct Option: 4**

**Type: ME**

**24) The voltage-current characteristics of a dc generator for arc welding is a straight line between an open-circuit voltage of 80 V and short-circuit current of 300 A. The generator settings for maximum arc power will be**

**Options:**

- 1.a) 80 V & 150 A
- 2.b) 40 V & 300 A
- 3.c) 40 V & 150 A
- 4.d) 80 V & 300 A

**Correct Option: 3**

**Type: ME**

**25) In orthogonal cutting, the depth of cut is 0.5 mm at a cutting speed of 2 m/s. If the chip thickness is 0.75 mm, the velocity is**

**Options:**

- 1.a) 1.33 m/s

- 2.b) 2 m/s
- 3.c) 2/5 m/s
- 4.d) 3 m/s

**Correct Option:** 1

**Type:** ME

**26) A straight teeth slab milling cutter of 100 mm diameter and 10 teeth rotating at 200 rpm is used to remove a layer of 3 mm thickness from a steel bar. If the table feed is 400 mm/minute, the feed per tooth in this operation will be**

**Options:**

- 1.a) 0.2 mm
- 2.b) 0.4 mm
- 3.c) 0.5 mm
- 4.d) 0.6 mm

**Correct Option:** 1

**Type:** ME

**27) A company intends to use exponential smoothing technique for making a forecast for one of its products. The previous year's forecast has been 78 units and the actual demand for the corresponding period turned out to be 73 units. If the value of the smoothening constant  $\alpha$  is 0.2, the forecast for the next period will be:**

**Options:**

- 1.a) 73 units
- 2.b) 75 units
- 3.c) 77 units
- 4.d) 78 units

**Correct Option:** 3

**Type:** ME

**28) Consider the following linear programming problem  
 $\text{Max } Z = 2A + 3B$ , subject to  $A + B \leq 10$ ,  $4A + 6B \leq 30$ ,  $2A + B \leq 17$ . A and B are positive  
 What can one say about the solution?**

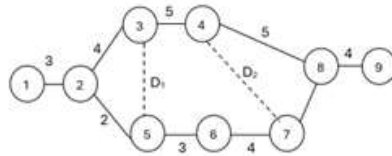
**Options:**

- 1.a) It may contain alternative optima
- 2.b) The solution will be unbounded
- 3.c) The solution will be degenerate
- 4.d) It cannot be solved by simplex method

**Correct Option: 1**

**Type: ME**

**29) In the network shown in figure, the critical path is along**



**Options:**

- 1.a) 1-2-3-4-8-9
- 2.b) 1-2-3-5-6-7-8-9
- 3.c) 1-2-3-4-7-8-9
- 4.d) 1-2-5-6-7-8-9

**Correct Option: 2**

**Type: ME**

**30) In a PERT network, expected project duration is found to be 36 days from the start of the project. The variance is four days. The probability that the project will be completed in 36 days is:**

**Options:**

- 1.a) zero
- 2.b) 34%
- 3.c) 50%
- 4.d) 84%

**Correct Option: 3**