



# SSC JE 2019-20

Mechanical Engineering

Mini Mock Challenge  
(June 13- June 14 2020)

Questions &  
Solutions

1. Select the option which has the same relationship between word-pair as the relationship in the given word-pair.

Uttarakhand : Dehradun

- A. Bihar : Buxar
- B. Madhya Pradesh : Indore
- C. Delhi : New Delhi
- D. Rajasthan : Udaipur

Ans. C

Sol. The Relationship is- Indian State : its capital.

Hence, option C is the correct answer.

2. Three of the following four letter- clusters are alike in a certain way and one is different. Find the odd one out.

- A. LQVA
- B. HMRW
- C. BEHK
- D. KPUZ

Ans. C

Sol.

Option(a)-  $L \xrightarrow{+5} Q \xrightarrow{+5} V \xrightarrow{+5} A$

Option(b)-  $H \xrightarrow{+5} M \xrightarrow{+5} R \xrightarrow{+5} W$

Option(c)-  $B \xrightarrow{+3} E \xrightarrow{+3} H \xrightarrow{+3} K$

Option(d)-  $K \xrightarrow{+5} P \xrightarrow{+5} U \xrightarrow{+5} Z$

Hence, option C is the correct answer.

3. **Arrange the given words in the sequence in which they occur in the dictionary.**

- 1) Objectivity,
  - 2) Obsolete,
  - 3) Omnifarious,
  - 4) Omnipotent
- A. 2, 1, 4, 3
  - B. 2, 1, 3, 4
  - C. 1, 2, 4, 3
  - D. 1, 2, 3, 4

Ans. D

Sol. After arranging all the word arranged alphabetically order as in a dictionary,

- 1. Objectivity,
- 2. Obsolete,
- 3. Omnifarious,
- 4. Omnipotent.

So the correct sequence is 1, 2, 3, 4.

Hence, option D is the correct answer.

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4. If **TIE = 14** and **BYE = 12**, then how will you code **PRO** ?
- A. 25
  - B. 23
  - C. 29
  - D. 35

Ans. C

Sol. As,

$$TIE = T+I+E = 20+9+5 = 34; 34-20 = 14, \text{ and}$$

$$BYE = B+Y+E = 2+25+5 = 32; 32-20 = 12$$

Similarly,

$$PRO = P+R+O = 16+18+15 = 49; 49-20 = 29$$

Hence, option C is the correct answer.

5. A series is given with one term missing. Select the correct alternative from the given ones that will complete the series.

Q, V, S, X, U, Z, ?

- A. T
- B. W
- C. G
- D. K

Ans. B

Sol. Pattern is-

$$Q \xrightarrow{+5} V \xrightarrow{-3} S \xrightarrow{+5} X \xrightarrow{-3} U \xrightarrow{+5} Z \xrightarrow{-3} W$$

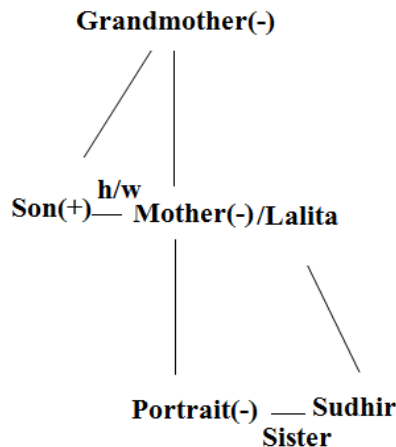
Hence, option B is the correct answer.

6. Pointing to a portrait Sudhir said, her Grandmother's only son is married to Lalita who is my mother. How's the woman in the portrait related to Sudhir?

- A. Aunty
- B. Mother
- C. Sister
- D. Grandmother

Ans. C

Sol.

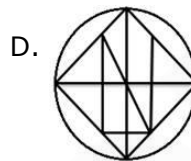
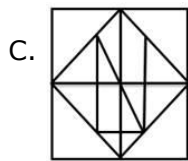
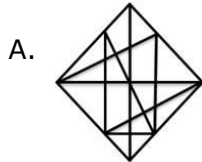


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Its given that her(woman in the portrait) Grandmother’s son is married to Lalita who is my(Sudhir) mother. It means Sudhir is looking at his own sister.

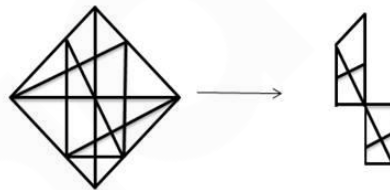
Hence, option C is the correct answer.

7. Select the option in which the given figure is embedded. (Rotation is not allowed)



Ans. A

Sol. After carefully observing the figures given in the question, it is very clear that the question figure is embedded in answer figure (B). It is shown as given below:



Hence, Option A is the correct answer.

8. In the following question, select the word which cannot be formed using the letters of the given word.

JURISDICTION

A. CONDUITS

B. JUNCTION

C. DISCOUNT

D. INDUCTOR

Ans. B

Sol. The word JURISDICTION has only one N whereas JUNCTION has 2 N’s.

Hence, option B is the correct answer.

9. If '+' means '-', '-' means 'x', 'x' means '÷', and '÷' means '+', then what is the value of  $7 + 12 \div 16 \times 4 + 6 - 11 + 3$

A. 70

B. 54

C. 23

D. -70

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Ans. D

Sol.  $7 + 12 \div 16 \times 4 + 6 - 11 + 3$

After placing the actual sign in each place -

$\Rightarrow 7 - 12 + 16 \div 4 - 6 \times 11 - 3$

$\Rightarrow -5 + (16 \div 4) - (6 \times 11) - 3$

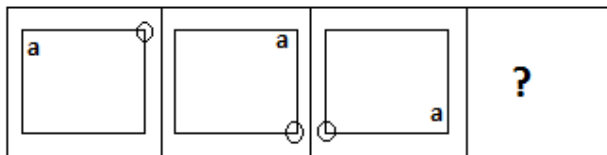
$\Rightarrow -5 + 4 - 66 - 3$

$\Rightarrow -70$

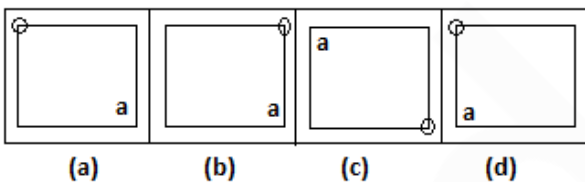
Hence, option D is the correct answer.

10. In the question given below which of the option figures will come after the problem figures, if the sequence were continued?

**Question Figure:**



**Answer figure:**

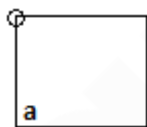


- A. (a)    B. (b)  
 C. (c)    D. (d)

Ans. D

Sol. Both the elements are moving one step forward in the clockwise direction.

According to the sequence, the next figure in the series will be -



Hence, option D is the correct answer.

11. Subhas Chandra Bose was elected President of the Haripura Congress Session in \_\_\_\_\_.  
 A. 1938    B. 1942  
 C. 1936    D. 1940

Ans. A

Sol. • Subhas Chandra Bose was elected President of the Haripura Congress Session in 1938. The session was held at Haripura, Gujarat, which was selected by Sardar Vallabh Bhai Patel.  
 • A resolution was passed in this session according to which, a six months ultimatum was given to the British Government demanding independence for India.

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12. Hiuen Tsang, hailed as the pilgrims, visited India during the reign of king \_\_\_\_\_.  
A. Ashoka  
B. Vishnugupta  
C. Harsha  
D. Samudragupta

Ans. C

Sol.

- The Chinese traveller **Hiuen Tsang** visited India during the reign of emperor **Harsha Vardhana**.
- He returned to China and wrote a detailed description of India during the rule of Harsha in his book '**Si-yu-ki**'.

13. The temperature at which relative humidity becomes 100 % is known as \_\_\_\_\_.  
A. Critical Temperature  
B. Crystal Point  
C. Dew Point  
D. Dwarf Point

Ans. C

Sol. • The temperature at which Relative Humidity becomes 100 % is known as **Dew point**. A higher dew point means there is more moisture in the air.

- The relation between Relative Humidity and Temperature is inversely proportional.
- When the temperature is below the freezing point of water, the dew point is called the frost point.

14. Which of the following parliamentary committee consists only of Lok Sabha members?  
A. Public Undertaking Committee  
B. Estimates Committee  
C. Departmental committees  
D. Public Account Committee

Ans. B

Sol. **Estimate committee of parliament consist members only from Lok Sabha.**

- Estimate committee has **30 members** from Lok Sabha.
- Its term is **one year**, and a minister cannot be elected to this.
- Main function of EC is to examine the estimates included in the budget presented in the parliament and suggests economies in public expenditure.

15. Sex Hormones are secreted by which of the following gland?  
A. Pancreas  
B. Pituitary gland  
C. Pineal gland  
D. Adrenal gland

Ans. B

Sol. • **Sex hormones** are **secreted** by **Pituitary gland**.

- It releases hormones that signal the reproductive organs to make sex hormones and also **controls ovulation and the menstrual cycle** in women.
- It is an endocrine gland about the **size of a pea**.

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16. What is the name of Jupiter Mission of NASA?
- A. Juno  
B. Main Job  
C. Project Apollo  
D. Parker Solar Probe

Ans. A

- Sol. • Juno - Jupiter Mission of NASA  
• Main Job - Mars Mission of NASA  
• Project Apollo - Moon Mission of NASA  
• Parker Solar Probe - Sun Mission of NASA

17. Kharchi Puja Festival is celebrated in which state?
- A. West Bengal  
B. Assam  
C. Manipur  
D. Tripura

Ans. D

Sol. **Kharchi Puja festival is celebrated in Tripura state.**

- \* It takes place in July month every year.
- \* The festival is dedicated to lord Shiva and other associated **14 deities**.
- \* These fourteen deities are situated in **Puran Haveli, Agartala**.
- \* Cultural events, fairs, competitions, rituals etc are performed during the festival?

18. India became member of SCO in which year?
- A. 2015  
B. 2016  
C. 2017  
D. 2018

Ans. C

Sol. **India becomes member of Shanghai Cooperation Organisation in 2017.** Along with India, Pakistan also became it's member in same year.

- Presently it has eight member states, four observer states, six dialogue partners and four guest attendances. Chinese and Russian are selected as official language of SCO.
- Presently Vlamdir Norov is it's Secretary General.
- SCO works on cooperation in Security, Military activities and exercises, Economics and Culture. It also aims to restrict Terrorism in the region and terror funding in the region.

19. "All roads lead to Ganga" is written by \_\_\_\_\_.
- A. RK Narayan  
B. Kiran Desai  
C. Jhumpa Lahiri  
D. Ruskin Bond

Ans. D

Sol. 'All roads lead to Ganga' is **written by Ruskin Bond**.

- Ruskin Bond, resident of Mussoorie, is a well-known writer of fiction and a poet also. He was awarded the Sahitya Academy Award in 1992 and Padam Bhushna in 2014.
- Some of his major works are- His Tales and Legends from India, Angry River, Strange Men, Strange Places, The Blue Umbrella, A Long Walk for Bina and Hanuman to the Rescue.

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20. The **Fourth Global Ayurveda Festival (GAF)** will be held at \_\_\_\_\_ from 16-20 May, 2020.

- A. Lucknow
- B. Dehradun
- C. Bhopal
- D. Kochi

Ans. D

Sol. \* The **Fourth Global Ayurveda Festival (GAF)** will be held at **Kochi in Kerala** from 16-20 May, 2020.

\* Prime Minister Narendra Modi will participate in the summit.

\* The festival will be organized under the **Ministry of AYUSH**.

\* The theme for the five-day event is "**Ayurveda Medical Tourism: Actualizing India's credibility**".

21. In case of two meshing gears both with involute tooth profiles, contact is made when the tip of the:

- A. Driven wheel touches the flank of the driving wheel
- B. Driven wheel touches the face of a tooth of the driving wheel
- C. Driving wheel touches the face of a tooth of the driven wheel
- D. Driving wheel touches the flank of a tooth of the driven wheel

Ans. A

Sol. when the two gear mesh, contact is made when the tip of the of driven wheel touches the flank of the driving wheel

22. R-744 is used as refrigerant in refrigeration system. Find the molecular mass of refrigerant.

- A. 74
- B. 744
- C. 44
- D. 447

Ans. C

Sol. Given refrigerant R-744

For inorganic refrigerant, refrigerant is represented by R-(700+molecular mass)

So, Molecular mass is 44 and refrigerant is Carbon di-oxide.

23. If plain carbon steel in the austenitic condition is quenched in water to room temperature, its structure changes from 'austenite' to

- A. Pearlite
- B. Martensite
- C. Cementite
- D. Ferrite

Ans. B

Sol. Martensite is formed in carbon steels by the rapid cooling (quenching) of the austenite form of iron at such a high rate that carbon atoms do not have time to diffuse out of the crystal structure in large enough quantities to form cementite ( $Fe_3C$ ). Austenite is  $\gamma$ -Fe, (gamma-phase iron), a solid solution of iron and alloying elements. As a result of the quenching, the face-centered cubic austenite transforms to a highly strained body-centered tetragonal

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form called martensite that is supersaturated with carbon. The shear deformations that result produce a large number of dislocations, which is a primary strengthening mechanism of steels. The highest hardness of a pearlitic steel. The martensitic reaction begins during cooling when the austenite reaches the martensite start temperature ( $M_s$ ) and the parent austenite becomes mechanically unstable. As the sample is quenched, an increasingly large percentage of the austenite transforms to martensite until the lower transformation temperature  $M_f$  is reached, at which time the transformation is completed.

24. In any casting process, shrinkage allowance on the pattern is provided in order to compensate for shrinkage when
- A. The temperature of the liquid metal drops from the pouring to its freezing temperature
  - B. The metal changes from the liquid to the solid state at its freezing temperature
  - C. The temperature of solid phase drops from its freezing temperature to room temperature
  - D. The temperature of metal drops from its pouring temperature to room temperature

Ans. C

Sol. Thus, Shrinkage allowance provided on the pattern to compensate the solid shrinkages taking place during the cooling of the material from freezing temp to room temp as a solid.

25. Which one of the following key types is pressed against the shaft for power transmission by friction between the key and the shaft?
- A. Feather key
  - B. Square key
  - C. Flat key
  - D. Saddle key

Ans. D

Sol. Saddle keys are fitted only in the key way of one member of the mating surface i.e. either shaft or hub. Saddle keys are only of uniform width, and tapered in thickness along the length. Power transmission of the saddle key is due to the frictional forces set up between the keys and the shaft. Saddle keys are of two types - i) Flat saddle key ii) Hollow saddle key

Flat Saddle Key .The flat saddle key is a taper key which fits in a key way in the hub and is flat on the shaft.

Hollow Saddle Key A hollow saddle key is a taper key which fits in a key way in the hub and its lower surface of the key is hollow or curved to fit on the curved surface of the shaft.

26. For a cylindrical material of dia 9 mm and length 10 mm the stress applied is equaled to 100MPa and the change in diameter is 0.9 mm and change in length is 2 mm. Find the poisson's ratio?
- A. 0.9
  - B. 0.55
  - C. 0.225
  - D. 0.5

Ans. D

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Sol. Poisson's ratio is given by = change in lateral strain/change in longitudinal strain  
Poisson's ratio =  $(0.9/9) / (2/10) = 0.5$

27. An elevator weighing 10 kN attains an upward velocity of 4m/s in 2 sec with uniform acceleration. The tension in the wire rope is nearly :

(take  $g = 10 \text{ m/s}^2$ )

- A. 6 kN
- B. 8 kN
- C. 10 kN
- D. 12 kN

Ans. D

Sol. The elevator in this problem is an non inertial frame, and so newtons laws can be directly applied to it.

Pseudo forces should also be taken into consideration.

For the pseudo forces, the acceleration of the block can be found by the following method

$$a = v/t = 4/2 = 2 \text{ m/s}^2$$

$$\text{mass, } m = \text{weight}/g = (10 \times 1000)/10 = 1000 \text{ kg}$$

$$\text{Then pseudo force} = ma = 1000 \times 2 = 2000\text{N} = 2 \text{ KN}$$

$$\text{then, the tension in the string} = N(\text{weight of the body}) + N(\text{pseudo force})$$

$$= 10 + 2 = 12 \text{ KN}$$

28. A shaft made of cast iron is subjected to pure torsion while transmitting power. Which of the following type of failure has the maximum probability to be found?

- A. Cup and cone
- B. Brittle granular helicoidal
- C. Brittle spiral
- D. Shear failure

Ans. B

Sol. Cast iron is a brittle material and fails by tension. Hence, the failure most common to be found is brittle granular helicoidal.

29. Consider a cyclic process in which different states have heat interaction of 8 KJ, -10 KJ and 5 KJ respectively. The change in internal energy is

- A. 3 KJ
- B. -3 KJ
- C. 23 KJ
- D. 0

Ans. D

Sol. As we know, Internal energy is a point function thus its cyclic integral is always equals to zero

Thus, for a cyclic process, change in internal energy,  $dU = 0$

30. In computer aided drafting practice, an arc is defined by

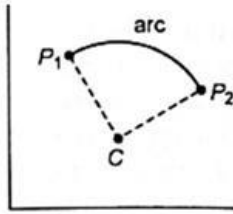
- A. two end points only
- B. center and radius
- C. radius and one end point
- D. two end points and centre

Ans. D

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Sol.



P<sub>1</sub> = First end point

P<sub>2</sub> = Second end point

C = Centre of arc

31. At a point in a bi-axially loaded member, the principal stresses are found to be 180 MPa and 60 MPa. If the critical stress of the material in shear is 240 MPa, what could be the factor of safety according to the maximum shear stress theory?

- A. 2
- B. 2.66
- C. 1.33
- D. 3.33

Ans. B

Sol. given,

$$\sigma_1 = 180\text{MPa}, \sigma_2 = 60\text{MPa} \sigma_3 = 0\text{MPa}$$

As per Tresca's max shear stress theory,

$$\max \left| \frac{\sigma_1 - \sigma_2}{2}, \frac{\sigma_2 - \sigma_3}{2}, \frac{\sigma_3 - \sigma_1}{2} \right| \leq \frac{S_{ys}}{N} \text{ or } \frac{S_{yt}}{2N}$$

$$\max \left| \frac{180 - 60}{2}, \frac{60 - 0}{2}, \frac{0 - 180}{2} \right| \leq \frac{240}{N}$$

$$\max |60, 30, -90| \leq \frac{240}{N}$$

$$90 \leq \frac{240}{N} \Rightarrow N \geq 2.66$$

32. Which one of the following heat treatment process improves machinability?

- A. Annealing
- B. Process annealing
- C. Normalizing
- D. Spheroidizing

Ans. D

Sol. metals are annealed to facilitate cold working. To relieve residual stresses induced in cold working and spheroidized to improve machinability, cold formability and working ability like in hypereutectoid steels (%C > 0.8%)

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33. The path of contact of two gears in a mesh is 50 mm and the pressure angle is  $45^\circ$ . The module is 8 mm. Find the contact ratio of these two gears.
- A. 4.2
  - B. 1.9
  - C. 3.7
  - D. 2.8

Ans. D

Sol. Arc of contact = Path of contact/cos  $\phi$  =  $50/\cos 45^\circ = 70.71$  mm  
Contact ratio = Arc of contact/ Circular pitch = Arc of contact /  $\pi m$  =  $70.71/(\pi \times 8) = 2.8$ .

34. Curtis turbines an example of —
- A. Pressure compounded impulse steam turbine
  - B. Pressure — Velocity compounded impulse steam turbine
  - C. Reaction steam turbine
  - D. Velocity compounded impulse steam turbine

Ans. A

Sol. Curtis turbine is the pressure compounded steam turbine in which drop of pressure is takes place in number of stages.  
Steam is allowed to flow in the number of stages of fixed blades and moving blades. pressure drop takes place in fixed blade which results in increase in the kinetic energy which is utilized in the moving balde.

35. Which of these abrasives is not used in Ultrasonic machining (USM)?
- A. Boron Carbide
  - B.  $Al_2O_3$
  - C. Silver-Tungsten Alloy
  - D. Silicon Carbide

Ans. C

Sol. The abrasive grains used in USM are Boron Carbide,  $Al_2O_3$ , Silicon Carbide or even Diamond dust. These abrasives are used to machine hard and brittle materials like carbides, ceramics, tungsten, glass, etc.

36. Tension in the tight side of a belt drive is 100 N & that in the slack side is 60 N if the belt breadth is 10 cm & thickness 4 cm what is the maximum stress induced in the belt?
- A.  $2.5 \text{ N/cm}^2$
  - B.  $1.5 \text{ N/cm}^2$
  - C.  $4 \text{ N/cm}^2$
  - D.  $2 \text{ N/cm}^2$

Ans. A

Sol. We know that the maximum tension is given by:

$$T_{\max} = \sigma \times \text{Area} = \sigma \times b \times t$$
$$\text{or, } \sigma = \frac{T_{\max}}{bt}$$
$$= \frac{100}{10 \times 4} = 2.5$$

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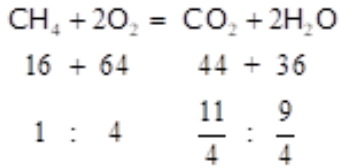
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37. Methane burns with stoichiometric quantity of air. The air-fuel ratio by weight is
- A. 14.7
  - B. 4
  - C. 15
  - D. 17.4

Ans. D

Sol.



Oxygen in air by weight = 23%

$$\text{A/F ratio} = \frac{4/0.23}{1} = 17.39$$

38. Which of the following type of mixture is being supplied to a bike where the ignition is on, but the bike is stopped at a traffic signal?
- A. Lean mixture
  - B. Rich mixture
  - C. Stoichiometric mixture
  - D. Rich air mixture

Ans. B

Sol. \* The question defines the idling condition indirectly.

\* To overcome exhaust gas dilution during idling rich mixture is being supplied.

39. In a furnace the thickness of the refractory wall lining is 150 mm and the average thermal conductivity of the refractory material is 0.05 W/mk. If the temperature difference between the inner and outer sides of the furnace is 150 °c, the heat loss per unit area to the surroundings will be:
- A. 50 W/m<sup>2</sup>
  - B. 70 W/m<sup>2</sup>
  - C. 90 W/m<sup>2</sup>
  - D. 120 W/m<sup>2</sup>

Ans. A

Sol. Given,

thickness of the refractory wall, b =150 mm

thermal conductivity of the refractory material, K = is 0.05 W/mk

temperature difference = 150°C,

$$Q = KA \frac{(T_1 - T_2)}{b} \Rightarrow q = K \frac{(T_1 - T_2)}{b} \text{ W / m}^2$$

$$q = 0.05 \times \frac{150}{0.15} = 50 \text{ W / m}^2$$

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40. The maximum and minimum speed of a governor is 50 rad/s and 30 rad/s. Its sensitiveness is
- A. 0.5
  - B. 1
  - C. 2
  - D. 0.25

Ans. C

Sol.  $\omega_{\max} = 50 \text{ rad/s}$ ,  $\omega_{\min} = 30 \text{ rad/s}$

$$\omega_{\text{avg}} = (50 + 30)/2 = 40 \text{ rad/s}$$

$$\text{sensitivity} = \frac{N_{\text{avg}}}{N_{\text{max}} - N_{\text{min}}} = \frac{\omega_{\text{avg}}}{\omega_{\text{max}} - \omega_{\text{min}}}$$

$$S = \frac{40}{50 - 30} = 2$$

41. Gauge pressure is equal to
- A. Absolute pressure + atmospheric pressure
  - B. Absolute pressure — atmospheric pressure
  - C. Atmospheric pressure — absolute pressure
  - D. None of these

Ans. B

Sol. Absolute pressure is zero-referenced against a perfect vacuum, so it is equal to gauge pressure plus atmospheric pressure. Gauge pressure is zero-referenced against ambient air pressure, so it is equal to absolute pressure minus atmospheric pressure. Negative signs are usually omitted.

42. A Carnot refrigerator operates between 27°C and 127°C. Its Coefficient of Performance is
- A. 3
  - B. 4
  - C. 0.25
  - D. None of these

Ans. B

Sol. Given,

$$T_L = 27^\circ\text{C} = 300\text{K}, \quad T_H = 127^\circ\text{C} = 400\text{K}$$

$$\text{COP} = \frac{T_L}{T_H - T_L} = \frac{300}{400 - 300} = 3$$

43. For Reheat cycle when compared to simple Rankine cycle, the dryness fraction at exhaust \_\_\_\_\_ and the condenser load \_\_\_\_\_.
- A. Increases: Increases
  - B. Increases: Decreases
  - C. Decreases: Increases
  - D. Decreases: Decreases

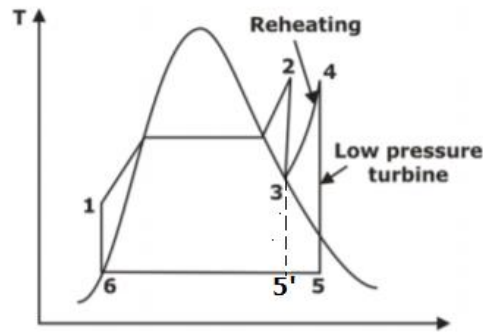
Ans. A

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Sol.



from the figure,

after the reheat, dryness fraction is  $x_{5'}$  which is greater than  $x_5$

and condenser load was  $= h_{5'} - h_6$

after reheat  $= h_5 - h_6$

which is also increased.

so the correct option will be A

44. A bar of mild steel 1m long and 50 mm × 50 mm in cross section is subjected to an axial load of 200 kN. If E is 200 GPa , the elongation of the bar will be
- |            |            |
|------------|------------|
| A. 0.16 mm | B. 0.08 mm |
| C. 0.4 mm  | D. 0.02 mm |

Ans. C

Sol.  $b = 50 \text{ mm}$

$h = 50 \text{ mm}$

$L = 1 \text{ m} = 1000 \text{ mm}$

$F = 200 \text{ kN} = 200000 \text{ N}$

$E = 200 \text{ GPa} = 200 \times 10^3 \text{ N/mm}^2$

$$\Delta L = \frac{PL}{AE} = \frac{200 \times 10^3 \times 1000}{50 \times 50 \times 200 \times 10^3} = 0.4 \text{ mm}$$

45. A fluid jet discharging from 20 mm diameter orifice has a diameter 17.5 mm at its Vena-Contracta. The coefficient of contraction will be nearly:
- |         |         |
|---------|---------|
| A. 0.98 | B. 0.88 |
| C. 0.77 | D. 0.67 |

Ans. C

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Sol. Given,

orifice diameter = 20mm

diameter at Vena-Contracta = 17.5mm

$$\text{coefficient of contraction} = \frac{\text{Area of vena contracta}}{\text{Area of orifice}} = \frac{\frac{\pi}{4} d^2}{\frac{\pi}{4} d_o^2}$$

$$C_c = \frac{\frac{\pi}{4} 17.5^2}{\frac{\pi}{4} 20^2} = 0.765$$

46. While designing the refrigeration system of an aircraft, the prime consideration is that the
- A. mass of the refrigeration equipment is low
  - B. system has high C.O.P
  - C. power per Ton of Refrigeration is low
  - D. mass of the refrigerant circulated in the system is low

Ans. A

Sol. Aircraft air refrigeration systems are required due to heat transfer from many external and internal heat sources (like solar radiation and avionics) which increase the cabin air temperature. With the technological developments in high-speed passenger and jet aircrafts, the air refrigeration systems are proving to be most efficient, compact and simple. While designing any aircraft systems the main problem faced by the designers is its mass. So, the correct answer is (A).

47. A cube of volume 27000cc is subjected to a hydrostatic stress of 1400kg/cm<sup>2</sup>. The bulk modulus of the material is 2.5 × 10<sup>6</sup>kg/cm<sup>2</sup>. Calculate the volume change as a result of the stress applied.
- A. 9.45cc
  - B. 15.12cc
  - C. 23.21cc
  - D. 8.65cc

Ans. B

Sol. Given, V = 27000cc, σ = 1400kg/cm<sup>2</sup>

Bulk modulus, K = 2.5 × 10<sup>6</sup>kg/cm<sup>2</sup>

$$\text{Bulk modulus, } K = \frac{\sigma}{\left(-\frac{dV}{V}\right)}$$

$$-\frac{dV}{V} = \frac{\sigma}{K} \Rightarrow -\frac{dV}{27000} = \frac{1400}{2.5 \times 10^6}$$

$$dV = 15.12\text{cc}$$

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48. The core is made of:

- A. Sand
- B. Ceramic
- C. Metal
- D. All of these

Ans. A

Sol. A core is a replica of internal features of part to be cast which is normally made of sand that forms interior part of casting. In metal casting, mould provides a space for molten metal to go as the core keeps metal from filling the entire space. The core acts as a negative, displacing molten metal as it is poured into the casting mould.

49. What is the amount of maximum work that can be extracted from a Carnot engine working between temperature 1000 K and 350K if 4kJ heat is supplied to the engine?

- A. 1.4kJ
- B. 3.6kJ
- C. 2.6kJ
- D. Non of the above

Ans. C

Sol. Given,

Source temperature,  $T_H = 1000K$

Sink Temperature  $T_L = 350K$

heat Supplied,  $Q_S = 4kJ$

$$\eta = \frac{\text{work done}}{\text{Heat Supplied}} = 1 - \frac{T_L}{T_H}$$

$$\frac{W_{\text{net}}}{4} = 1 - \frac{350}{1000}$$

$$W_{\text{net}} = 2.6kJ$$

50. Fifty observations of a production operation revealed a mean cycle time of 10 min. the worker was evaluated to be performing at 90% efficiency. Assuming the allowances to be 10% of the normal time, the standard time (in seconds) for the job is

- A. 9.9
- B. 7.3
- C. 594
- D. 540

Ans. A

Sol. Given: Mean cycle time = 10 min

The workers performing at 90% efficiency

$$\text{So, Normal time} = 10 \times \frac{90}{100} = 9 \text{ min}$$

Allowance = 10%

Standard time = Normal time + Allowance

$$= 9 + 9 \times \frac{10}{100} = 9 + 0.9 = 9.9 \text{ min}$$

\*\*\*\*

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# Upcoming Mini Mock Challenge in June Month

## SSC JE

### Mechanical Engineering

Exam	Live Date	Syllabus	No. of Questions	Time
SSC JE Mini Mock Test-1	06 June 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-2	13 June 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-3	20 June 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-4	27 June 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30

