



SSC JE 2019-20

Mechanical Engineering

Mini Mock Challenge
(July 22- July 23 2020)

Questions &
Solutions

1. '**Taj Mahal**' is related to '**Agra**' in the same way '**Victoria Memorial**' is related to '_____.'
- A. Kolkata
B. Kerala
C. Mumbai
D. New Delhi

Ans. A

Sol. Taj Mahal is situated in Agra city and Victoria Memorial is situated in Kolkata.
Hence, option A is the correct answer.

2. **In the following question, select the odd letter group from the given alternatives.**
- A. AF
B. HM
C. UZ
D. TO

Ans. D

Sol. Clearly, the first letter moves five steps forward to give the second letter except 'TO'.

$$A + 5 = F$$

$$H + 5 = M$$

$$U + 5 = Z$$

$$T + 5 = \mathbf{Y}$$

Hence, option D is the correct answer.

3. **Arrange the following words in a logical and meaningful order.**
- 1) Helium
2) Carbon
3) Beryllium
4) Hydrogen
5) Boron
6) Lithium
A. 4, 1, 6, 3, 5, 2
B. 4, 1, 3, 5, 2, 6
C. 4, 5, 2, 1, 6, 3
D. 1, 4, 6, 5, 3, 2

Ans. A

Sol. Correct order is-

4. Hydrogen(Atomic number=1)

1. Helium(Atomic number=2)

6. Lithium(Atomic number=3)

3. Beryllium(Atomic number=4)

5. Boron(Atomic number=5)

2. Carbon(Atomic number=6)

Correct order is- 4, 1, 6, 3, 5, 2.

Hence, option A is the correct answer.

4. If **THOR** is coded as **20** and **RANKED** is coded as **42**, then how will **STRENGTH** be coded as?
- A. 56
B. 48
C. 73
D. 72

Ans. D

Sol. The pattern of code language is multiplication of total number of letters with its just succeeded number.

Total number of letters in THOR is 4×5 (succeeded number) = 20

Similarly, RANKED = $6 \times 7 = 42$

Therefore, code of STRENGTH = $8 \times 9 = 72$

Hence, option D 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.**

R, T, ?, A, F, H

A. Y

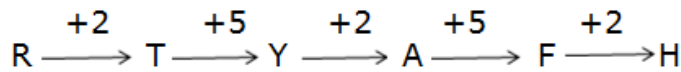
B. M

C. G

D. Q

Ans. A

Sol. Given series follows the pattern given below:



Hence, option A is the correct answer.

6. Anupama's father's brother-in-law is the brother of Katrina. How's Katrina related to Anupama?

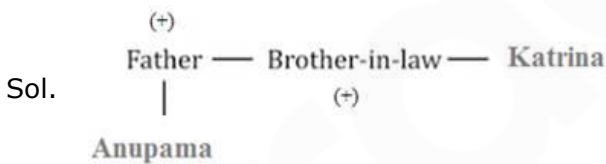
A. Mother-in-law

B. Sister

C. Niece

D. Can not be determined

Ans. D



Since, we do not know the gender of either Anupama or Katrina.

Therefore, We can not determine the correct answer.

Hence, option D is the correct answer.

7. **Find the missing number.**

9	5	3
4	2	6
2	8	?

A. 6

B. 10

C. 16

D. 15

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Ans. A

Sol. In 1st column: $9 + 4 + 2 = 15$

In 2nd column: $5 + 2 + 8 = 15$

Similarly, in 3rd column:

$$3 + 6 + x = 15$$

$$x = 6$$

Hence, option A is correct.

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

EXTRANEOUS

A. RATE

B. NATION

C. EXTRA

D. RUN

Ans. B

Sol. In this question, we show that the letter 'I' is used once in option B but the letter 'I' is not used in the word EXTRANEOUS. Thus we cannot form a word NATION.

Hence, option B is the correct answer.

9. **Which of the following two signs need to be interchanged to make the given equation correct?**

$$4 \times 6 \div 33 + 3 - 15 = 20$$

A. \times and $-$

B. $+$ and $-$

C. \div and \times

D. $+$ and \div

Ans. D

Sol. **By checking Option A,**

$$4 \times 6 \div 33 + 3 - 15 = 20$$

After changing the symbols,

$$4 - 6 \div 33 + 3 \times 15 = 20$$

Since, $6 \div 33$ will give result in decimal.

Therefore, $4 \times 6 \div 33 + 3 - 15 = 20$ is not the correct equation.

By checking Option B,

$$4 \times 6 \div 33 - 3 + 15 = 20$$

After changing the symbols,

$$4 \times 6 \div 33 + 3 - 15 = 20$$

Since, $6 \div 33$ will give result in decimal.

Therefore, $4 \times 6 \div 33 + 3 - 15 = 20$ is not the correct equation.

By checking Option C,

$$4 \times 6 \div 33 + 3 - 15 = 20$$

After changing the symbols,

$$4 \div 6 \times 33 + 3 - 15 = 20$$

Applying BODMAS we get,

$$= 4 \div 6 \times 33 + 3 - 15$$

$$= 22 + 3 - 15$$

$$= 25 - 15 = 10$$

Therefore, $4 \times 6 \div 33 + 3 - 15 = 20$ is not the correct equation.

By checking Option D,

$$4 \times 6 \div 33 + 3 - 15 = 20$$

After changing the symbols,

$$4 \times 6 + 33 \div 3 - 15 = 20$$

Applying BODMAS we get,

$$= 4 \times 6 + 11 - 15$$

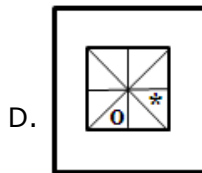
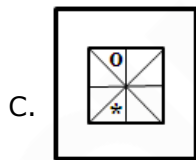
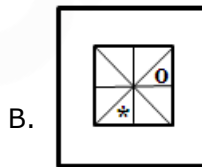
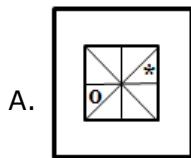
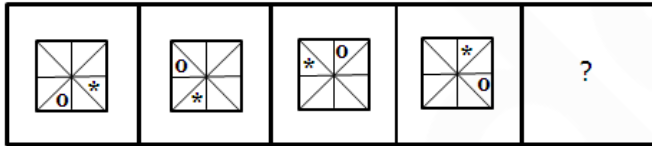
$$= 24 + 11 - 15$$

$$= 35 - 15 = 20$$

Therefore, $4 \times 6 \div 33 + 3 - 15 = 20$ is the correct equation.

Hence, option D is the correct response.

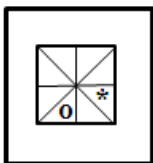
10. **Select the figure that will come next in the following figure series.**



Ans. D

Sol. After carefully observing the figures given in the question, it is very clear that the answer figure(d) will be the next figure.

Logic- * moves two steps clockwise and O also moves two steps clockwise.



Hence, option D is the correct answer.

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11. The method of constitution Amendment is provided in which of the following articles ?
- A. Article 348
 - B. Article 358
 - C. Article 368
 - D. Article 378

Ans. C

Sol. The procedure of **amendment** in the constitution is laid down in **Part XX (Article 368)** of the Constitution of India.

12. Lichens are constituted by_____.
- A. Fern & Fungi
 - B. Algae & Bryophata
 - C. Bacteria & Virus
 - D. Fungi & Algae

Ans. D

Sol. • A lichen is not a single organism. Rather, it is a symbiosis between different organisms - a fungus and an alga or cyanobacterium.

- Cyanobacteria are sometimes still referred to as 'blue-green algae', though they are quite distinct from the algae. The non-fungal partner contains chlorophyll and is called the photobiont. The fungal partner may be referred to as the mycobiont.

13. When was Poona pact concluded?
- A. 1932
 - B. 1934
 - C. 1933
 - D. 1936

Ans. A

Sol. • The Poona Pact refers to an agreement between B. R. Ambedkar on the reservation of electoral seats for the depressed classes in the legislature of British India government.

- It was concluded on 24 September 1932 at Yerwada Central Jail in Poona.

14. Dry Ice is nothing but
- A. Gaseous carbon dioxide
 - B. Washing soda
 - C. Solid carbon dioxide
 - D. Carbon monoxide

Ans. C

Sol. Dry ice is nothing but the solid CO_2 , When CO_2 is compressed under high pressure, it first come to liquid state and when more pressure is applied on it, it becomes solid. This solid is called as Dry Ice. Thus we can say that dry ice in solid state. Hence, option C is correct.

15. In June 2020, the world's largest plasma therapy trials for the COVID-19, "Project Platina" has been launched by which of the following state of India?
- A. Kerala
 - B. Maharashtra
 - C. Karnataka
 - D. Uttar Pradesh

Ans. B

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Sol. * **In June 2020, Maharashtra state government launched the world's largest plasma therapy trials for the COVID-19 "Project Platina".**

* This project was launched by the Chief Minister Uddhav Thackeray.

* The project is aimed at creating robust data for treating the disease for which no specific line of treatment exists.

* The plasma therapy trials will be conducted in 17 medical colleges across the Maharashtra state.

16. Which one of the following rivers originates near Mahabaleshwar?

- A. Godavari
- B. Krishna
- C. Kaveri
- D. Tapi

Ans. B

Sol. Mahabaleshwar is a city in Maharashtra.

- **It is the source of the Krishna River** that flows across Maharashtra, Karnataka, Telangana and Andhra Pradesh.

- It is the fourth-biggest river in terms of water inflows and river basin area in India.

17. Who was defeated by Babar in the First Panipat war?

- A. Ibrahim Lodi
- B. Bahulal Lodi
- C. Sikander Lodi
- D. Muhammed Lodi

Ans. A

Sol. • First Battle of Panipat (21 April 1526) was fought **between the forces of Babur and the Lodi Kingdom.**

- **Ibrahim Lodi died** on the field of battle along with 15,000 of his troops.

- The battle of Panipat was militarily a decisive victory.

18. The period of pendulum depend upon_____.

- A. Mass
- B. Length
- C. Amplitude
- D. Energy

Ans. B

Sol. **The period of pendulum** depends on the **length** of the **pendulum** and also to a **slight degree** on the amplitude, the **width** of the pendulum's swing.

19. What is the maximum strength prescribed for State Legislative Assemblies?

- A. 350
- B. 600
- C. 500
- D. 750

Ans. C

Sol. The Legislative Assembly consists of not more than 500 members and not less than 60. The biggest state like Uttar Pradesh has 403 members in its Assembly. States which have small population and are small in size have a provision for having even lesser number of members in the Legislative Assembly. Puducherry has 30 members. Mizoram, Goa have only 40 members each. Sikkim has 32 members.

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24. Relation between number of links (L) and number of pairs (P) is_____.
- A. $L = 2P - 2$ B. $L = 2P - 3$
C. $L = 2P - 4$ D. None of these

Ans. C

Sol. If each link is assumed to form two pairs with two adjacent links then the relation between number of pairs forming kinematic chain is,

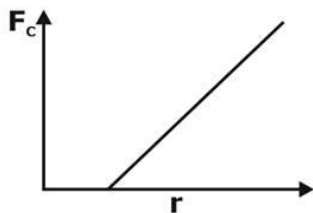
$$L = 2P - 4$$

25. Which flame produces roaring sound in gas welding?
- A. Neutral flame B. Carburizing flame
C. Oxidizing flame D. None of these

Ans. C

Sol. • Oxidizing flame produces roaring sound in gas welding.

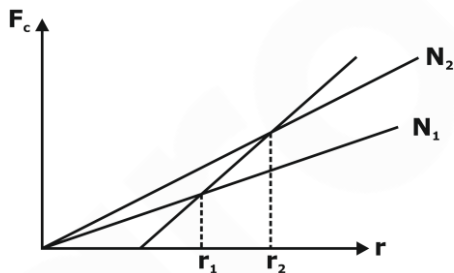
26. A controlling diagram for a spring controlled governor is shown. This governor is a _____.



- A. Stable governor. B. Unstable governor.
C. Isochronous governor. D. Nothing can be said.

Ans. A

Sol. Drawing the speed line



$$N_2 > N_1$$

$$r_2 > r_1$$

Hence by increasing the speed, the radius of rotation of balls is also increasing, thus it is a stable governor.

27. The state of stress at a point is given by $\sigma_x = 120$ MPa, $\sigma_y = 80$ MPa, $\tau_{xy} = 40$ MPa. What is the maximum shear stress at that point?
- A. 47.22MPa B. 44.72MPa
C. 39.64MPa D. 36MPa

Ans. B

Sol. Given,

$\sigma_x = 120\text{ MPa}, \sigma_y = 80\text{ MPa}, \tau_{xy} = 40\text{ MPa}$

Maximum shear stress at a point = Radius of Mohr's circle

$$\tau = \sqrt{\left(\frac{\sigma_x - \sigma_y}{2}\right)^2 + \tau_{xy}^2}$$

$$\tau = \sqrt{\left(\frac{120 - 80}{2}\right)^2 + 40^2}$$

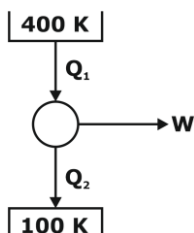
= 44.72MPa

28. In a reversible heat engine the temperature limits are 100 K and 400 K.If heat output is 200 kJ and heat input is_____.

- A. 400 kJ
- B. 200 kJ
- C. 100 kJ
- D. 800 kJ

Ans. D

Sol. For a reversible heat engine,



By Clausius Inequality,

$$\frac{Q_1}{Q_2} = \frac{T_1}{T_2}$$

$$\frac{Q_1}{200} = \frac{400}{100}$$

$Q_1 = 800\text{ kJ}$

29. Formation of BUE is reduced by_____.

- A. Increasing feed
- B. Increasing depth of cut
- C. Decreasing rake angle
- D. Increasing cutting speed

Ans. D

Sol. High temperature is the main cause of formation of BUE. Reduction/elimination of BUE can be done by

- a) increasing cutting speed
- b) increasing rake angle
- c) decreasing depth of cut
- d) decreasing feed

30. Continuity equation for 2 - D incompressible and steady flow is_____.

- A. $A_1V_1 = A_2V_2$
- B. $A_1V_2 = A_2V_1$
- C. Both A and B
- D. None

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Ans. A

Sol. • Continuity equation for 2 – D incompressible and steady flow means

inflow = outflow

i.e. $A_1V_1 = A_2V_2$

31. An aluminum block is subjected to an axial stress of 150MPa. What is the maximum shear stress generated in the block?

A. 75MPa

B. 85MPa

C. 100MPa

D. 120MPa

Ans. A

Sol. Given,

Uniaxial stress in block $\sigma_x = \sigma_1 = 150\text{MPa}$

Max. Shear stress in block, $\tau = \frac{\sigma_1 - \sigma_2}{2}$

Under uniaxial loading, $\sigma_2 = 0$

$$\tau = \frac{150 - 0}{2} = 75 \text{ MPa}$$

32. A Carnot heat pump works between temperature limits of 277°C and 27°C. Its COP is

A. 1.10

B. 1.20

C. 2.20

D. 9.26

Ans. C

Sol. COP of heat pump is given by:

$$(\text{COP})_{\text{H.P.}} = \frac{T_H}{T_H - T_L}$$

$$(\text{COP})_{\text{H.P.}} = \frac{550}{550 - 300}$$

$$= 2.20$$

33. The cyclic integral of internal energy of closed process is

A. Zero

B. Greater than one

C. Less than one

D. None of these

Ans. A

Sol. In a cyclic process the system returns to its initial state and so the internal energy is not changed.

34. Which of the following is not a property of a system?

A. Temperature

B. Heat

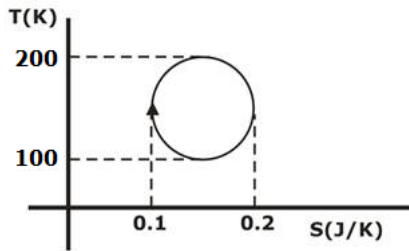
C. Pressure

D. Specific volume

Ans. B

Sol. To define any state of the system, the variables which are required are known as properties. temperature, pressure, Specific volume are the properties of the system. Heat is not a property of the system.

35. T-S plot for a process is given:

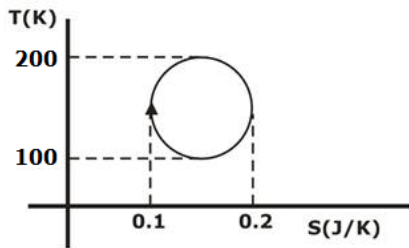


The work done (in J) is ____.

- A. 7.85
- B. 4.46
- C. 3.47
- D. None of these

Ans. A

Sol. Given,



For cyclic process: $TdS = PdV$

Thus work done = Area = $\pi \times \left(\frac{200 - 100}{2}\right) \times \left(\frac{0.2 - 0.1}{2}\right) = 7.85 \text{ J}$

36. The property by which an amount of energy is absorbed by a material without plastic deformation is called_____.

- A. Toughness
- B. Impact strength
- C. Ductility
- D. Resilience

Ans. D

Sol. • Resilience is defined as the ability of a material to absorb energy when deformed elastically and return to Original form when unloaded.

37. An enclosure consists of four surfaces 1, 2, 3 and 4. The view factors for radiation heat transfers are

- $F_{11} = 0.1$
- $F_{12} = 0.4$
- $F_{13} = 0.25$

The surface areas A_1 and A_4 are 4 m^2 and 2 m^2 . The view factor F_{41} is

- A. 0.50
- B. 0.75
- C. 0.10
- D. 0.25

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Ans. A

Sol. Given,

$$F_{11} = 0.1$$

$$F_{12} = 0.4$$

$$F_{13} = 0.25$$

By summation rule,

$$F_{11} + F_{12} + F_{13} + F_{14} = 1$$

$$0.1 + 0.4 + 0.25 + F_{14} = 1$$

$$F_{14} = 0.25$$

Reciprocity relation,

$$A_1 F_{14} = A_4 F_{41}$$

$$4 \times 0.25 = 2 \times F_{41}$$

$$F_{41} = 0.5$$

38. For two cycles coupled in series, the topping cycle has an efficiency of 40% and the bottoming cycle has an efficiency of 30%. The overall combined cycle efficiency is
- A. 50% B. 44%
C. 58% D. 82%

Ans. C

Sol. $\eta = \eta_1 + \eta_2 - \eta_1 \times \eta_2$

$$\eta = 0.40 + 0.30 - 0.4 \times 0.3$$

$$\eta = 58\%$$

39. The pressure in meters of oil of specific gravity 0.9 equivalent to 90 m of water is
- A. 90 m B. 100 m
C. 80 m D. 95 m

Ans. B

Sol. For equivalent pressure,

$$S_1 h_1 = S_2 h_2$$

$$0.9 \times h = 90 \times 1$$

$$h = 100 \text{ m}$$

40. Once-through boilers operate at
- A. subcritical pressure
B. supercritical pressure
C. subcritical as well as supercritical pressures
D. None of these

Ans. B

- Sol. • Once through boilers are those boilers in which there is no boiler drum.
• Water is directly flashed off into steam thus they work above the critical point i.e. supercritical pressure operation, above 221.2 bar.

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41. Pyrometers are used for
- A. Measuring the velocity of air.
 - B. Measuring the high temperature.
 - C. Measuring the purity of air.
 - D. For calculating the relative of moist air.

Ans. B

Sol.

Instrument	Measurement
Hot wire Anemometer	Velocity of air
Pyrometer	Temperature measurement
Psychrometer	Relative Humidity
Hygrometer	Humidity

42. A cylinder with volume $6m^3$ is floating in water with $2/3$ of the cylinder is inside water. Calculate the weight of the cylinder.

- A. 58.860 kN
- B. 39.24 kN
- C. 19.62 kN
- D. 392.4 kN

Ans. B

Sol. Given,

$$V = 6m^3, \quad V_{\text{submerged}} = 2/3 \text{ of } 6m^3 = 4m^3$$

For floating body,

Weight of the body = Force of buoyancy

$$= \rho_{\text{water}} gV_{\text{submerged}}$$

$$= 1000 \times 9.81 \times \frac{2}{3} \times V_{\text{cylinder}}$$

$$= 1000 \times 9.81 \times \frac{2}{3} \times 6$$

$$= 39.24 \text{ kN}$$

43. The shaft of a motor starts from rest and attains full speed of 1800 rpm in 10 seconds. The shaft has an angular acceleration of _____ rad/sec².

- A. 3π
- B. 6π
- C. 2π
- D. 18π

Ans. B

Sol. Given

$$\omega_1 = 0.$$

$$N_2 = 1800 \text{ rpm}$$

$$\omega_2 = \frac{2\pi N}{60} = \frac{2\pi \times 1800}{60} = 60\pi$$

$$\text{Angular Acceleration } (\alpha) = \frac{\omega_1 - \omega_2}{t} = \frac{60\pi - 0}{10} = 6\pi.$$

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44. In a pipeline 2520 m long, the velocity of propagation of pressure wave is 840 m/s. rapid closure of a downstream valve will entail, when the maximum time for the closure is
- A. 3 sec
 - B. 4 sec
 - C. 2 sec
 - D. 6 sec

Ans. D

Sol. Time taken by pressure wave to travel from valve to the tank and tank to the valve = $\frac{2L}{C}$

Where, L is the length of the pipe

C velocity of propagation of pressure waves

$$= \frac{2 \times 2520}{840} = 6 \text{ sec}$$

45. Clausius' statement and Kelvin-Planck's statement are _____.
- A. Not connected
 - B. Two parallel statements of the second law
 - C. Violation of one does not violates the other
 - D. False statements

Ans. B

Sol. **The Kelvin-Planck Statement:** It is impossible to construct a device which operates on a cycle and produces no other effect than the transfer of heat from a single body in order to produce work.

The Clausius Statement: It is impossible to construct a device which operates on a cycle and produces no other effect than the transfer of heat from a cooler body to a hotter body. So both are two parallel statement of second law of thermodynamics.

46. Which of the following curves yield most conservative estimate when a material is subjected to fluctuating loads_____.
- A. Soderberg
 - B. Goodman
 - C. Gerber
 - D. ASME Elliptic curve

Ans. A

Sol. • Soderberg criteria results in the most conservative estimate for same factor of safety.

47. Two alternatives can produce a product. First has a fixed cost of Rs. 2000 and a variable cost of Rs. 20 per piece. The second method has a fixed cost of Rs. 1500 and a variable cost of Rs.30. The break even quantity between the two alternatives is
- A. 25
 - B. 50
 - C. 75
 - D. 100

Ans. B



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Sol.

Machine	Fixed cost	Variable Cost
A	2000	20
B	1500	30

break even point is the quantity at which total cost from both the machine is same.

If x is the break even quantity, then

$$2000 + 20x = 1500 + 30x$$

$$\text{or, } x = 50.$$

48. A shaft under experiment condition show stress concentration factor of 6. What will be theoretical calculated stress concentration, if its notch sensitivity is 0.5

- A. 3
- B. 12
- C. 11
- D. 6

Ans. C

Sol. We know that $q = \frac{k_f - 1}{k_t - 1}$

Given, $q = 0.5, K_f = 6$

$$0.5 = \frac{6 - 1}{k_t - 1} \Rightarrow k_t = 11$$

49. Decrease in evaporator pressure of VCRC results

- A. Increase in refrigeration effect
- B. Increase in work input
- C. Increase in COP
- D. Cant say

Ans. B

Sol. Effect of decrease in evaporator pressure of VCRC results,

- Decrease in R.E.
- Increase in work input
- Decrease in COP
- Decrease in volumetric efficiency

50. A certain engine has Indicated Power of 15 kW and mechanical efficiency=80%. The friction power is

- A. 15 kW
- B. 12 kW
- C. 3 kW
- D. 3.75 kW

Ans. C

Sol. Given,

Indicated Power=15 kW, mechanical efficiency=80%,

Brake Power=mechanical efficiency x Indicated Power

$$= 15 \times 0.8 \text{ kW} = 12 \text{ kW.}$$

Thus, friction power = Indicated Power-Brake Power

$$= 15 - 12 = 3 \text{ kW}$$

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Upcoming Mini Mock Challenge in July Month

SSC JE

Mechanical Engineering

Exam	Live Date	Syllabus	No. of Questions	Time
SSC JE Mini Mock Test-1	08 July 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-2	15 July 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-3	22 July 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30
SSC JE Mini Mock Test-4	29 July 2020	Full Syllabus (Tech. (30 Q's) & Non-Tech. (20 Q's))	50	30



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