MEGA MOCK CHALLENGE

gradeup

SSC JE 2019–20

Mechanical Engineering

Mini Mock Challenge
(June 06- June 07 2020)

Questions & Solutions

1. **In the following question, select the related letters from the given alternatives.**

EKMR : VPNI : : SJWG : ?

A. HQTD
B. HMQT
C. HDTQ
D. HQDT

Ans. D

Sol. If we arrange alphabets in two rows as shown below, the letters are related as follows,

A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N

So SJWG will be related to,

A	B	C	D	E	F	G	H	I	J	K	L	M
Z	Y	X	W	V	U	T	S	R	Q	P	O	N

Thus SJWG is related to HQDT.

Hence, option D is the correct answer.

2. **In the following question, select the related number from the given alternatives.**

11 : 121 : : 111 : ?

A. 1234
B. 2314
C. 12321
D. 12421

Ans. C

Sol. As,

$11^2 = 121$

Similarly,

$111^2 = 12321$

Thus 111 is related to 12321.

Hence, option C is the correct answer.

3. **In the following question, select the odd number from the given alternatives.**

A. 497
B. 809
C. 648
D. 164

Ans. B

Sol. Square of the digit at the extreme right end is equal to the rest of the digits of the number

7x7=49

8x8=64

4x4=16

9x9=81 and not 80

Hence, option B is the correct answer.

4. **In the following question, select the odd word from the given alternatives.**

A. Lavani
B. Bihu
C. Jhumar
D. Ballet

Ans. D

Sol. All except ballet are folk dances.

Hence, option D is the correct answer.

5. **Arrange the following words in a logical sequence.**

1) Result
2) Exam
3) School
4) Study
5) Admission

A. 5, 3, 1, 4, 2
B. 3, 5, 2, 4, 1
C. 3, 5, 4, 2, 1
D. 3, 4, 5, 2, 1

Ans. C

Sol. Generally,

First we find the school(1),

Then we take admission(2),

Then we study(3)

Then we take exam(4)

And finally we get the result(5).

Correct sequence = 3, 5, 4, 2, 1

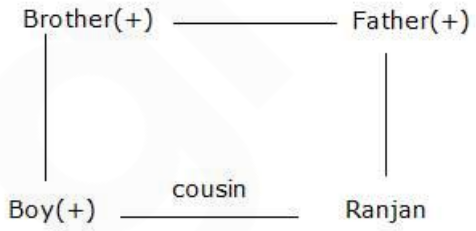
Hence, option C is the correct answer.

6. Pointing to a boy Ranjan said, "He is the son of my father's brother". How is Ranjan related to that boy?

A. Uncle
B. Sibling
C. Cousin
D. Son

Ans. C

Sol. From the text given in the questions, we can draw following family tree-



Hence, option C is the correct answer.

7. In a certain code language, "**SALMON**" is written as "**VDOPRQ**". How is "**FISH**" written in that code language?

A. ILVK
B. KILL
C. VILK
D. EILK

Ans. A

Sol. As, SALMON is coded as VDOPRQ

S+3=V

A+3=D

L+3=O

M+3=P

O+3=R

N+3=Q

Similarly,

F+3=I

I+3=L

S+3=V

H+3=K

So, FISH is coded as ILVK.

Hence, option A is the correct answer.

8. **In the following question, select the missing number from the given alternatives.**

5	2	8	10	20
7	5	6	3	27
2	8	41	5	42
35	7	3	8	49
12	4	8	11	?

A. 52

B. 71

C. 81

D. 60

Ans. A

Sol. Horizontally,

(5*8)-(2*10)=40-20=20

(7*6)-(5*3)=42-15=27

(2*41)-(8*5)=82-40=42

(35*3)-(7*8)=105-56=49

(12*8)-(4*11)=96-44=52

So, Missing Number=52

Hence, option A is the correct answer.

9. Two statements are given, followed by two conclusion I and II. Assuming these statements to be true, even if they seem to be at variance with commonly known facts, decide which of the given conclusion logically follow (s) from the statements.

Statements:

Some boxes are dolls.

All dolls are pen.

Conclusion:

I. Some boxes are pens.

II. Some pens are boxes.

III. Some pens are dolls.

IV. All pen are dolls.

A. Only conclusion II, III and IV follow.

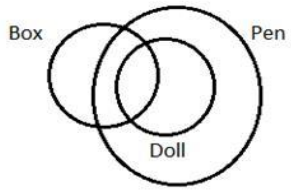
B. Only conclusion I, II and III follow.

C. Only conclusion I, II and IV follow.

D. All the conclusion follow.

Ans. B

Sol. Minimum possible diagram is-



Conclusion:

I. Some boxes are pens.(It follows as its obvious from the above diagram.)

II. Some pens are boxes.(It also follows as its obvious from the above diagram.)

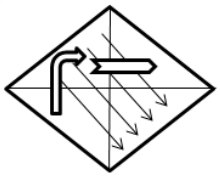
III. Some pens are dolls. .(It also follows as its obvious from the above diagram.)

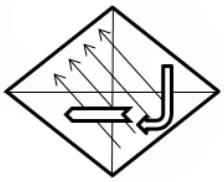
IV. All pen are dolls. .(It does not follow as its just a possibility, not surety.)

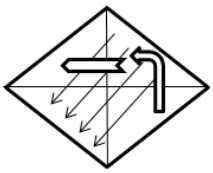
So, Only conclusion I, II and III follow.

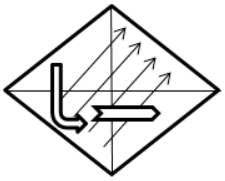
Hence, option B is the correct answer.

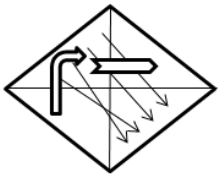
10. **Select the correct mirror of the given figure when the mirror is placed on the right of the figure.**



A. 

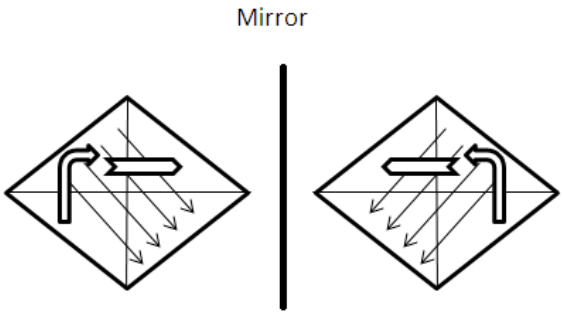
B. 

C. 

D. 

Ans. B

Sol. In a plane mirror, a mirror image is a reflected duplication of an object that appears almost identical, but it is reversed in the direction perpendicular to the mirror surface. As an optical effect it results from reflection of substances such as a mirror or water.



Hence, option B is the correct answer.

11. 104th amendment of the constitution is related to which article?

A. Article 15 B. Article 16

C. Article 334 D. Article 335

Ans. C

Sol. • 104th amendment of the constitution is related to Article 334. This amendment was done on 25 Jan 2020.

• This amendment was done to extend the reservation of seats for SCs and STs in the Lok Sabha and states assemblies from seventy years to eighty years.

12. The doctrine of basic structure of constitution was given in which case?

A. Golak Nath case B. Keshwanand bharti case

C. Minerva mills case D. Indira Sahani case

Ans. B

Sol. The doctrine of basic structure of constitution was given in **Keshwanand bharti case**, 1973.

* In this case, The Supreme Court held that the Parliament has power to amend any provision of the constitution, but doing so, the basic structure of the constitution is to be maintained.

* The basic features of the Constitution include:

Supremacy of the constitution, Republican and democratic form of government, Secular character of the constitution, Federal character of the constitution, Separation of power etc.

13. Who is referred to as 'Frontier Gandhi'?

A. Sheikh Abdullah B. Manilal Gandhi

C. Khan Abdul Gaffar Khan D. Gopal Krishna Gokhale

Ans. C

Sol. Abdul Ghaffār Khān', nicknamed Bāchā Khān or Pāchā Khān, was a Pashtun independence activist against the rule of the British Raj. He was a political and spiritual leader known for his nonviolent opposition, and a lifelong pacifist and devout Muslim

14. The Battle of Plassey was fought in year

A. 1775 B. 1761

C. 1576 D. 1757

Ans. D

Sol. The Battle of Plassey was fought between British East India company and Nawabs of Bengal in 1757. The English East India company's forces under Robert Clive defeated Siraj-ud-daulah the Nawab of Bengal.

15. International Women's Day is observed on _____ .

A. January 1 B. February 28

C. March 8 D. April 30

E. March 1

Ans. C

Sol.

- International Women's Day (March 8) is a global day celebrating the social, economic, cultural and political achievements of women.
- The day also marks a call to action for accelerating gender parity.

16. Which type of soil is most abundant in deccan plateau?

A. Alluvial Soil B. Red Soil

C. Black Soil D. Laterite Soil

Ans. C

Sol. • **Black Soil is most abundant is Deccan plateau region.**

• It is also known as Regur Soil & it has black colour due to abundance of Iron, magnesium and aluminium.

• It is most suitable for Cotton cultivation.

• These soils are mainly found in Maharashtra, Madhya Pradesh, parts of Karnataka, Andhra Pradesh, Gujarat and Tamil Nadu.

17. Which are the Youngest Fold Mountains of the world?

A. Andes B. Atlas

C. Ural D. Himalayas

Ans. D

Sol. The Himalayas is the Youngest Fold Mountains of the world.

• Himalayas are lifted by the subduction of the Indian tectonic plate under the Eurasian Plate.

• Himalayan rocks consist mostly of uplifted sedimentary and metamorphic rocks.

• Himalayan Glaciers are the world's largest ice cap regions outside Polar Regions.

• Himalayan mountains have come out of a great geosyncline called the Tethys Sea and that the uplift has taken place in different phases.

18. Which artery gives blood supply to the brain?

A. Coronary artery
B. Common carotid artery
C. Subclavian artery
D. Brachiocephalic artery

Ans. B

Sol. • **The carotid arteries** are major blood vessels in the neck that supply blood to the brain, neck and face. There are two carotid arteries, one on the right and one on the left.

• In the neck, each carotid artery branches into two divisions: the internal carotid artery supplies blood to the brain and the external carotid artery supplies blood to face and neck.

19. Which of the following phenomenon is observed in prisms & rainbows?

A. Interference
B. Refraction
C. Dispersion
D. Scattering

Ans. C

Sol. * **Dispersion phenomenon is observed in prisms and rainbows.**

* The separation of visible light into its different colours is known as dispersion. When light passes through prism it splits into its seven colour and bend according to their frequencies.

20. Recently which country launched its first military satellite 'Noor'?

A. Pakistan
B. Iran
C. Iraq
D. Afghanistan

Ans. B

Sol. * Recently **Iran** launched its first military satellite '**Noor'**.

* The satellite is launched by **Ghased Launcher**.

* The Satellite was launched by **Iran's Islamic Revolutionary Guard Corps** (IRGC).

* IRGC is operates its own military infrastructure in parallel to armed forces and answerable only to Leader **Ayatollah Ali Khamenei**.

* The US administration has warned that the technology used to launch satellites could help Iran develop Inter Continental Ballistic Missiles

21. In impression die forging excess layer of material all around the forging is _____

A. Flash
B. Gutter
C. Cavity
D. None of these

Ans. A

Sol. In closed die forging it is very difficult to calculate exact amount of material to be kept between die, hence to overcome this difficulty, gutter is provided.This is called impression die forging.Some excess amount of material is kept inside the main die cavity and excess amount of material during operation comes out from main die cavity known as flash.This flash get collected in the gutter after the operation it is grinded off to get the final product.

22. The ingredients, dry silica sand and phenol formaldehyde are used in _____.

A. Plaster mould casting
B. Vaccum casting
C. Ceramic mould casting
D. Shell module casting

Ans. D

Sol. In shell moulding, a mettalic pattern is clamped over a box containing mixture of sand ,silica grains, phenolic resin (phenol formaldehyde) and alcohol.Mettalic pattern is heated around 230° C and box is inverted and mixture of sand ,additives and alcohol is allowed to fall over the heated pattern.Depending upon the time of contact this phenolic resin along with sand makes a shell over the heated pattern whereas alcohol is provided for localised heating.After some time shell will be removed and two to three such shells are joined together to form a mould.

23. The casting defects which is not caused due to moulding material is ___.

A. Swell
B. Metals penetration
C. Fusion
D. Cold shut

Ans. D

Sol. **Swell:**Under the influence of metallostatic force, the mould wall may move back causing a swell in the dimensions of the casting.This is due to improper ramming of moulding sand.
Metal Penetration: If the mould surface is too soft and porous, the liquid metal may flow between the sand particles up to a distance, into the mould.This causes rough,porous projections and this defect is called penetration.The main reason for this is that either grain size of sand is too course or no mould wash has been applied to mould cavity.
Fusion: This is caused by fusion of sand grains with the molten metal, giving a brittle, glassy appearance on the casting surface.
Cold Shut: When two streams of molten metal are not able to fuse together then the defect appeared is called cold shut.This is due to improper fluidity of molten metal and by increasing pouring temperatures this defect can be avoided.

24. For a single riveted joint the tearing resistance, crushing resistance and shearing resistance of rivet are 2460 N, 2260 N and 2830 N respectively. The strength of the solid plate is 4600 N. Then the efficiency of the joint will be _____.

A. 49.6%
B. 50.30%
C. 49.13%
D. none of these

Ans. C

Sol. Given,
Tearing resistance of rivet = 2460 N
Crushing resistance of rivet = 2260 N
Shearing resistance of rivet = 2830 N

Strength of the unriveted or solid plate = 4600 N

$$\text{Efficiency of riveted joint} = \frac{\text{Least of } \left(P_{tearing},\ P_{crushing},\ P_{shearing}\right)}{\text{Strength of plate without rivets}}$$

$$= \frac{2260}{4600} = 49.13\%$$

25. In a temperature-time diagram (TTT diagram), the time scale is _____.

A. Linear
B. Logarithmic Scale
C. Exponential Scale
D. None of above.

Ans. B

Sol. The information on the change of phase with the cooling rate can be conveniently displayed with the help of a time-temperature-transformation diagram. In temperature-time diagram, the temperature is plotted along vertical axis (using linear scale), whereas the abscissa represents the time on a logarithmic scale.

26. Down milling is the process of removing metal by a cutter which is rotated _____ direction of the travel of the workpiece.

A. in the same
B. against the
C. can't say anything
D. none of the mentioned

Ans. A

Sol. In down milling or climb milling, the direction of rotation is in same direction as movement of the workpiece.The chip thickness varies from maximum to minimum and milling cutter approaches workpiece in direction of workpiece motion.Hence more tool life and good surface finish is obtained.

27. Grain number of grinding wheel is ___ to grain size.

A. Directly proportional
B. Inversely proportional
C. Does not depend
D. None of the mentioned

Ans. B

Sol. $\text{Grain number} = \frac{1}{\text{Grain size}}$,hence grain number is inversely proportional to grain size.The larger the size of the grains, the more will be the material removal capacity, but the quality of the surface finish deteriotes.Thus, the grain size is determined primarily by surface quality requirement.

28. Which of the following is the result of time loss due to progressive combustion?

A. Peak pressure is obtained before piston reaches TDC.
B. Efficiency is reduced.
C. Work produced increases.
D. None of above

Ans. B

Sol. In air standard cycles, the heat addition is assumed to be an instantaneous process whereas in actual cycle it is over a definite period of time.Hence peak pressure will not occurs when volume is minimum ie. piston at TDC, rather it occurs when piston has moved from TDC . Due to this work reduces and thus efficiency also reduces.

29. The measurement of frictional power by willan's line is applicable only to _____.

A. SI engines at a particular speed. B. CI engines at a Particular speed.

C. Any engine at a Particular speed. D. None of above.

Ans. B

Sol. The measured frictional power by this method will hold good only for a particular speed and is applicable mainly to CI engine. Willan's line is a graph connecting fuel consumption (y-axis) and brake power (x- axis) at constant speed and it is extended on negative axis of brake power.The intercept of negative axis is taken as frictional power.

30. Blowing down of boiler water is the process to _____.

A. Reduce the boiler pressure.

B. Control the solid concentration in boiler water .

C. Increase the steam temperature.

D. Remove dissolved gases in water.

Ans. B

Sol. Blowing down of boiler water is the removal of some of the concentrated saline water and its replacement with relatively dilute feed water. Blow down may be carried out at intervals or continuously, the amount of blowdown being governed by allowable solids concentration and purity of feed water.

$$\text{Blow down} = \frac{\text{Quantity of water blown}}{\text{Quantity of feed water}} \times 100$$

31. Which of the following statements is true for an isentropic process?

A. Heat transfer is zero

B. Heat transfer may or may not be zero

C. Isentropic is always reversible adiabatic

D. Internal reversibility is always zero

Ans. B

Sol. An isentropic process is the process in which the entropy remains same.In reversible adiabatic process , since the process is reversible hence no entropy generation due to irreversibilty and also since no heat transfer is there, hence no entropy tranfer also.Thus an reversible adiabatic process is isentropic.But if in a irreversible process if the entropy generated due to heat transfer cancels out by entropy reduction due to heat tranfer , this process also becomes isentropic but was not adiabatic.Hence in isentropic process heat may or may not transfer and a reversible adiabatic process is isentropic, but an isentropic (if irreversible) process is not adiabatic.Hence depends on whether process is irreversible or reversible, in isentropic process heat may or may not be tranfer.

32. Which of the following is not true about Prandtl Number?

A. It is a dimensionless number.

B. It is not a property of fluid.

C. It is the ratio of momentum diffusivity to thermal diffusivity.

D. The Prandtl Number of air at room temperature is 0.71

Ans. B

Sol. Prandtl number is the ratio of molecular diffusivity of momentum (simply momentum diffusivity) to molecular diffusivity of heat (simply Thermal diffusivity). The momentum diffusivity is described by kinematic viscosity (v) and thermal diffusivity is (α)

$$Pr = \frac{u}{\alpha}$$

$u = \frac{\mu}{\rho}$ and $\alpha = \frac{K}{\rho c}$ where μ is dynamic viscosity and K is thermal conductivity

$Pr = \frac{\mu c}{K} = \left(\frac{\delta}{\delta_{th}}\right)^3$ where δ and δ_{th} are Hydrodynamic and thermal boundary layer thickness respectively.

Hence prandtl number is dimensionless and is a property of the fluid.Prandtl number for air at room temperature is 0.71,which means thermal diffusvity is more than momentum diffusivity.

33. A 30 mm diameter disc is to be punched out from a steel sheet 2 mm thick. The diameter (in mm) of the punch is _____ (Shear strength of material is 225 MPa)

A. 30.192 B. 29.904

C. 30.096 D. 29.808

Ans. D

Sol. Given

Diameter of disc = 30 mm

Thickness of sheet (t) = 2 mm

Shear strength (τ) = 225 MPa

Puch Diameter = Die Diameter – Diametrical Clearance

Diametrical Clearance (C) = $0.0064 \times t \times \sqrt{\tau}$

$C = 0.0064 \times 2 \times \sqrt{225}$

C = 0.192 mm

Punch Diameter = 20 – 0.192 = 29.808 mm

34. Axial thrust is the limitation of the helical spur gear due to which gears have lesser life span.The type of gears arrangement used to overcome axial thrust in helical spur gear is _____.

A. Herringbone gear
B. worm gear
C. double straight spur gear
D. skewed gear

Ans. A

Sol. • A herringbone gear is used to avoid axial thrust.
• When two helical gear are placed side by side it cancels the axial thrust and the resulting gear is called herringbone gear.

35. Ratio of actual mass of water vapour in a given volume of moist air to the mass of water vapour in same volume of saturated air at same temperature is known as _____.

A. Specific Humidity
B. Relative Humidity
C. Degree of saturation.
D. None of above

Ans. B

Sol. Relative Humidity is defined as ratio of actual mass of water vapour in a given volume of moist air to the mass of water vapour in same volume of saturated air at same temperature.

$$\phi = \frac{P_v}{P_s} = \frac{m_v}{m_s}$$

where

P_v = Vapour pressure

P_s = Vapour pressure at saturation state

m_v = mass of water vapour

m_s = mass of water vapour in saturated air

Degree of saturation is ratio of water vapour in a unit mass of dry air to mass of water vapour in same mass of dry air when it is saturated at same dry bulb temperature.

Specific humidity is mass of water vapour in 1 kg of dry air.

36. The degree of reaction for pelton turbine is _____.

A. Less than zero
B. Greater than zero
C. Equal to zero
D. Increases with steam velocity at the inlet

Ans. C

Sol. Degree of reaction is defined as the ratio of pressure energy change inside a runner to the total energy change inside the runner.

$$R = \frac{\text{Change of pressure inside the runner}}{\text{Change of total energy inside the runner}}$$

$$\text{Change in pressure energy inside the runner} = \frac{u_1^2 - u_2^2}{2g} + \frac{V_{r1}^2 - V_{r2}^2}{2g}$$

For pelton turbine, $u_1 = u_2$ and $V_{r1} = V_{r2}$

Hence degree of reaction is zero.

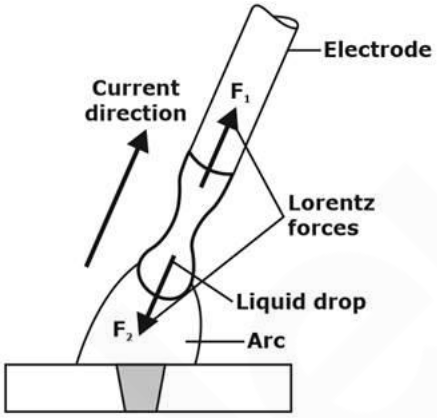
37. The cross section of the conductor is reducing in the direction of current in welding process.The direction of electromagnetic force on droplet of metal is _____.

A. In the direction of current.
B. Opposite to the direction of current.
C. Either of two.
D. None of above.

Ans. B

Sol. The electromagnetic force, known as Lorentz force is set up due to the interaction of electric current with its own field. This force helps in separation of drop in arc welding.

This force acts in the direction of current when the cross-section of conductor is increasing in direction of current. Similarly, the force, acts in direction opposite to that of an current if the cross-section of conductor is reducing in direction of current.



38. In gas cooled reactor, the moderator and the coolant respectively are _____.

A. Graphite and CO_2
B. Heavy water and CO_2
C. Graphite and Sodium
D. Heavy water and Sodium

Ans. A

Sol. In gas cooled reactor, the reactor core include a graphite moderator.The coolant is a gas, that could be CO_2, hydrogen ,helium and air.

39. The ratio of Euler's buckling load of columns with same parameters having both end fixed to the one end fixed and other end free is

A. 2
B. 4
C. 8
D. 16

Ans. D

Sol. Euler's Buckling load is given by,

$$P_{cr} = \frac{\pi^2 EI}{L_e^2}$$

case 1: when both end fixed

(i) $L_{e1} = \frac{L}{2}$,

case 2: for one end fixed, and other is free

(ii) $L_{e2} = 2L$

So ratio of both end fixed to the one end fixed and other end free is

$$\frac{Pcr_1}{Pcr_2} = \frac{\pi^2 EI}{Le_1^2} \times \frac{Le_2^2}{\pi^2 EI}$$

$$= \frac{Le_2^2}{Le_1^2}$$

$$= \frac{4L}{\left(\frac{L}{2}\right)^2} = 16$$

40. Which of the following welding technique uses magnetic focusing lens?

A. Electron beam welding
B. Laser beam welding
C. Ultrasonic welding
D. Flash-butt welding

Ans. A

Sol. In electron beam welding , electrons are generated with help of tungsten electrode and cup shaped electrode and are converged towards annular anode.Since anode has number of holes, majority of electrons passes through it.Electromagnetic focusing lens are provided to converge the electrons in the form of a beam.Since electron beam is a concentrated form of energy almost ideal weld can be obtained.When electron beam hit the workpiece X-rays will be produced and to absorb these X -rays, set up is lead lined.

41. In boilers, the feedwater treatment is done mainly for removing the _____.

A. Scale formation.
B. Corrosion
C. Embrittlement
D. All of above.

Ans. D

Sol. Scale is a hard or soft deposit on the internal surfaces of boiler. Due to this, heat transmission through heating surface is reduced. Corrosion is either due to water alkalinity or pressure. It produces pits or cracks. Embrittlement results from non-uniform corrosion leading to accelerated cracks in edges of plates. Hence to prevent all these precautions must be taken to treat water before using it.

42. Shear force at any cross-section on conjugate beam is _____.

A. Slope of real beam at that cross-section.
B. Deflection of real beam at that point.
C. Length of real beam
D. No relation with real beam

Ans. A

Sol. In conjugate beam method of finding deflection of beams, the length of conjugate beam is the same as the length of the actual beam.The loading diagram on the conjugate beam is simply the bending moment diagram of actual beam divided by the flexural rigidity EI of the actual beam and there are different support conditions for conjugate beam corresponding to support condition of actual beam.

There are two rules to find slope and deflection by conjugate beam method:

- The slope of the actual beam at any cross section is equal to the shearing force at the corresponding cross section of the conjugate beam.
- The deflection of the actual beam at any point is equal to the bending moment of the conjugate beam at the corresponding point.

43. The hoop strain of a thin pressure vessel subjected to an internal pressure P and internal diameter d is

A. $\frac{Pd}{4tE}(3-2\mu)$ B. $\frac{Pd}{4tE}(1-2\mu)$

C. $\frac{Pd}{4tE}(2-\mu)$ D. $\frac{Pd}{4tE}(1-3\mu)$

Ans. C

Sol. Given,

Thin Pressure vessel,

Internal pressure = P

Internal diameter= d

Circumferential or hoop strain,

$$\epsilon_{hoop} = \frac{\sigma_h}{E} - \frac{\mu\sigma_L}{E}$$

$$\text{hoop stresss } (\sigma_h) = \frac{pd}{2t},$$

$$\text{longitudinal stress } (\sigma_L) = \frac{pd}{4t}$$

$$\epsilon_{hoop} = \frac{Pd}{2tE} - \frac{\mu Pd}{4tE} = \frac{Pd}{4tE}(2-\mu)$$

where,

t = thickness

μ = Poisson's ratio

E = modulus of elasticity

44. The ratio of maximum shear stress to the shear stress at neutral axis for Square beam with a diagonal in vertical position is

A. 3/2 B. 4/3

C. 9/8 D. 7/5

Ans. C

Sol. For Square beam with a diagonal in vertical position is,

$$\tau_{max} = \frac{9}{8}\tau_{avg}$$

So,

$$\frac{\tau_{max}}{\tau_{neutral\ axis}} = \frac{9}{8}$$

45. The buoyant force is the _____.

A. Lateral force acting on a submerged body

B. Apparent weight of the body.

C. Net upward hydrostsatic force.

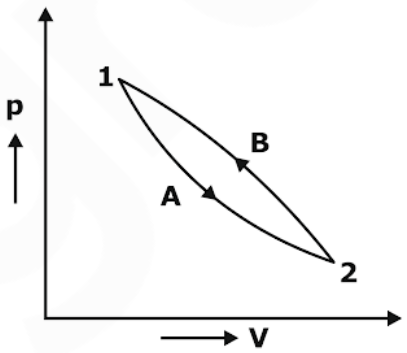
D. Hydrostatic force on a body due to fluid surrounding it.

Ans. C

Sol. Buoyant force is the net upward hydrostatic force on the body immersed in fluid.This net upward hydrostatic force is equal to the weight of the fluid displaced by the body and passes through the centre of gravity of the displaced fluid.

The word "Net upward " is what distinguishes buoyant force from the simple hydrostatic force because any body immersed will experience hydrostatic force on its surfaces in contact with fluid, but buoyancy is net upward hydrostatic force.

46. The system changes its state from 1 to 2, following path A and returns to state 2 following path B. The heat transfer in process A is 84 kJ/min and work done by the system is 32 kJ/min. The energy change (in kJ/min) of system in process B is _____.



A. 116

B. -116

C. -52

D. 52

Ans. C

Sol. Given

Heat transfer in process A (Q_A) = 84 KJ/min

Work done by system (W_A) = 32 KJ/min

ΔE_A be the energy change of system in process A

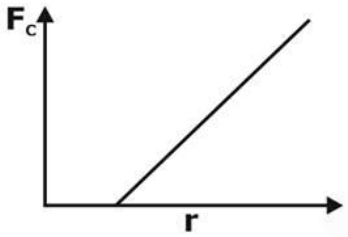
By first law

$\Delta E_A = Q_A - W_A = 84 - 32 = 52$ KJ/min

For the process B, since energy is property of system

$\Delta E_B = -\Delta E_A = -52$ KJ/min

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



A. Stable governor.

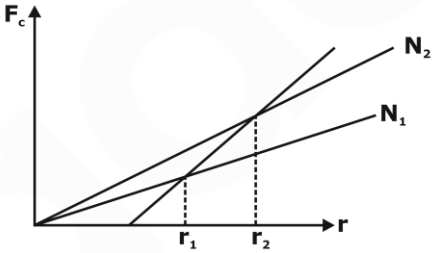
B. Unstable governor.

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.

48. If the moment due to actuating force and that due to friction force acts in the same direction, then the block brake is called _____.

A. Self-locking brake

B. Self-energizing brake

C. Uncontrolled brake

D. none of these

Ans. B

Sol. If the moment due to actuating force and that due to friction force acts in the same direction, then the block brake is called as self-energizing brake.In other words, frictional force helps to apply brakes.

49. 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/sec^2.

A. 3п
B. 6 п
C. 2 п
D. 18 п

Ans. B

Sol. Given

$\omega_1 = 0$.

$N_2 = 1800$ rpm

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

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

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

50. The constant 'a' in Rankine formula for the critical load of column is _____.

A. $\frac{E}{\pi^2 \sigma_c}$
B. $\frac{\pi \sigma_c}{E}$
C. $\frac{\sigma_c}{\pi^2 E}$
D. $(\pi^2 - 1)\frac{\sigma_c}{E}$

Ans. C

Sol. The critical load by Rankine formula is given by

$$P = \frac{\sigma_c . A}{1 + a\left(\frac{l_e}{k}\right)^2}, a = \frac{\sigma_c}{\pi^2 E}$$

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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

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