BYJU'S EXAM PREP

UPPSC Polytechnic

Civil Engineering

Mini Mock Challenge

(October 28th - October 29th 2021)

Questions & Solutions

1. A hydraulic jump occurs in a rectangular channel with the initial and sequent depth being equal to 0.23m and 2.1m; respectively, the energy loss is

   A. 1.042 m   B. 2.825 m

   C. 3.385 m   D. 4.386 m

Ans. C

1. Which one of the following statements is correct?

   A. Dynamic viscosity is the property of a fluid which is not in motion

   B. Surface energy is fluid property giving rise to the phenomenon of capillarity in water

   C. Cavitation results from the action of very high pressure

   D. Real fluids have lower viscosity than ideal Fluids

Ans. B

Sol. Dynamic viscosity is the property of fluid in motion in which one layer of fluid exerts viscous force on the other layer. Cavitation occurs due to negative pressure. Ideal fluids have no viscosity and surface tension and they are incompressible

2. Which one of the following statements is correct?

   A. For water at 100 ° Celsius at sea level, the vapour pressure is equal to atmospheric pressure.

   B. Surface energy (or tension) is caused by the force of adhesion between liquid molecules.

   C. Viscosity of a fluid is the property exhibited by it both in static and in dynamic conditions.

   D. Air is 5 00 times more compressible than water.

Ans. A

Sol. At boiling point the vapour pressure of a fluid becomes equal to the atmospheric pressure. Water boils at 100°DC therefore at 100°DC at sea level the vapour pressure, is equal to the atmospheric pressure.

Surface tension is caused by the force of cohesion between liquid molecules. Viscosity is exhibited by only fluid under dynamic conditions. Air is about 20000 times more compressible than water.

3. A vertical isosceles triangular gate with its vertex upwards has a base width of 2m and a height of 1.5m.If the vertex of the gate is 1m below the free water surface, then what will be the total pressure force and the position of centre of pressure respectively on one side of the plate?

   A. 29.43 kN,2.1m   B. 29.43 kN,1.1m

   C. 58.86 kN,2.1m   D. 58.86 kN,1.1m

Ans. A

Sol.

Location of centroid from the water surface, $\bar{h}$=1+1.5x2/3=2m

Total pressure force= Pressure at CG of the body x Area

=($\gamma_w \bar{h}$)xA=(9.81x2)x(1/2x2x1.5)=29.43 kN

Location of centre of pressure,h$_c$=$\bar{h}+\dfrac{I_{GG}}{A\bar{h}}sin^2\theta$=2+$\dfrac{\frac{2\times1\cdot5^3}{36}}{\frac{1}{2}X2X1.5\times2}$=2.1 m

4.   If the stream functions $\psi = 3x^2 - y^3$, what is the magnitude of velocity at point (2, 2)?

A. 9   B. 13

C. 15   D. 17

Ans. D

Sol. Stream function,

$$\psi = 3x^2 - y^3$$

$\therefore$ $\dfrac{\partial\psi}{\partial\psi} = 6x$ and $\dfrac{\partial\psi}{\partial y} = -3y^2$

But

$$u = -\dfrac{\partial\psi}{\partial y}$$

$$= -\left(-3y^2\right) = 3 \times 2^2 = 12$$

$$v = \dfrac{\partial\psi}{\partial y} = 6 \times = 6 \times 2 = 12$$

$\therefore$ Resultant velocity

$$= \sqrt{u^2 + v^2}$$

$$= \sqrt{(12)^2 + (12)^2} = \sqrt{288}$$

= 16.97 ≈ 17

5.   Consider the following with respect to the application of the Navier-Stokes equations:

1) Laminar flow in circular pipes

2) Laminar flow between concentric rotating cylinders

3) Laminar unidirectional flow between stationary parallel plates

4) Laminar unidirectional flow between parallel plates having relative motion

Which of these statements is/are correct?

A. 1 only   B. 2 and 3 only

C. 3 and 4 only   D. 1, 2, 3 and 4

Ans. D

Sol. If a certain mass of fluid is a motion, then it may be influenced by gravity forces (F_g), pressure   forces (F_P), viscous   forces (F_v), Turbulent   forces (F_t), surface   tension forces (F_s) and

Compressibility forces *(Fe)'* Then according to **Newton's** second law of motion, the following generalized equation of motion may be written i.e.

$$Ma = F_g + F_p + F_v + F_t, + F_s + F_e$$

When surface tension and compressibility forces are not significant, then the equation will be It is **Reynolds** equation of motion.

For laminar or viscous forces the turbulent forces also becomes less significant, thus the equation of motion reduces to

$$Ma = F_g + F_p + F_v$$

It is **Navier Stokes'** equation.

Application **Navier Stokes'** equation

- It is used in the pipe flow problems.
- Parallel plate fluid flow is also solved using this equation.
- Boundary layer equations are derived using **Navier Stokes.**

So, all the statements are correct.

6. The power transmitted through a pipeline is maximum when the head lost due to friction in the pipe is equal to

A. The total supply head   B. half 0f the total supply head

C. one third 0f the total supply head   D. one fourth of the total supply head

Ans. C

Sol. If H is the total supply head and h_f is the loss of head due to friction, then head available at the outlet of pipe (neglecting the minor losses) is $H - h_f$. if Q is the discharge through the pipe, V is the velocity of flow and L and D are the length and the diameter of the pipe respecting, then from dercy-Weisbach equation we have

$$h_f = \frac{fLV^2}{2gD} \quad and \quad Q = \frac{\pi D^2}{4} \times V$$

The power available at the outlet of pipeline is given by

$$P = \gamma Q\left(H - h_f\right)$$

$$\Rightarrow \quad P = \gamma \times \frac{\pi D^2}{4} \times V \times \left(H - \frac{fLV^2}{2gD}\right)$$

For a given pipe and head at the entrance, the condition for the maximum power transmitted through the pipe line may be obtained by differentiating Pw.r.t.V and equating it to zero

$$\therefore \quad \frac{dP}{dV} = \gamma \times \frac{\pi D^2}{4} \times \left(H - \frac{3fLV^2}{2gD}\right) = 0$$

$$\Rightarrow H - \frac{3fLV^2}{2gD} = 0$$

$$\Rightarrow H - 3h_f = 0$$

$$\Rightarrow h_f = \frac{H}{3}$$

7. The average drag coefficient for a laminar boundary layer over a flat plate was obtained as 0.018. If all other factors remain unchanged, and length of the plate is increased by 4 times its original value, this average drag coefficient would change to

A. 0.0036   B. 0.0056

C. 0.008   D. 0.009

Ans. D

Sol.

$$C_D = \frac{1.328}{\sqrt{Re_L}} = \frac{1.328}{\sqrt{\dfrac{pvL}{\mu}}}$$

$$\therefore \qquad C_D \propto \frac{1}{\sqrt{L}}$$

$$\therefore \qquad \frac{C_{D_1}}{C_{D_2}} = \frac{\sqrt{L_2}}{\sqrt{L_1}}$$

$$\Rightarrow \qquad \frac{0.018}{C_{D_2}} = \frac{\sqrt{4L_1}}{\sqrt{L_1}} \Rightarrow C_{D_2} = 0.009$$

8. A pipe of diameter 200 mm carries water in turbulent flow. The velocity of water at centre of pipe and 50 mm from centre of the pipe are 3 m/s and 2 m/s respectively. What is the shear stress at wall of the pipe.

A. 785 N/m^2 B. 614 N/m^2

C. 528 N/m^2 D. 334 N/m^2

Ans. D

Sol.

$$\frac{U_{max} - U}{U_*} = 5.75 \log_{10}\left(\frac{y}{R}\right)$$

Where, U_{max} = 3 m/s, U = 2 m/s at y = R − r = 0.1 − 0.05 = 0.05 m

$$\frac{3-2}{U_*} = 5.75 \log_{10}\left(\frac{0.1}{0.05}\right) = 1.73$$

$$\Rightarrow U_* = \frac{1}{1.73} = 0.578 \text{ m/s}$$

$$U_* = \sqrt{\frac{\tau_0}{\rho}}$$

$\Rightarrow \tau_0 = \rho U_*^2 = 1000 \times (0.578)^2 = 334.08$ N/m^2

9. The flow in a river is 1800 cumecs. A distorted model is built with horizontal scale of 1/100 and vertical scale of 1/25.The flow rate in the model should be

A. 0.36 cumecs   B. 0.144cumecs

C. 0.19 cumecs   D. 0.24 cumecs

Ans. B

Sol. $Q_r = A_r V_r$

From Froude model law, $V_r = \sqrt{L_r} = \sqrt{\left(\frac{1}{25}\right)} = 1/5$

$A_r = L_r B_r = (1/25) \times (1/100) = 1/2500$

$Q_r = (1/2500) \times (1/5) = Q_m/1800$

$Q_m = 0.144$ cumecs

10. The sequent depth ratio in a hydraulic jump formed in a rectangular horizontal channel is 10. The Froude number of the supercritical flow is

A. 12.2   B. 10.4

C. 7.42   D. 4.21

Ans. C

Sol.

$$\frac{y_2}{y_1} = 10 = \frac{1}{2}\left[\sqrt{1+8F_1^2}-1\right]$$

Froud no. of super critical flow,

$$F_1 = \sqrt{\frac{21^2-1}{8}}$$

$$\boxed{F_1 = 7.416}$$

11. In a trapezoidal channel with bed width of 2m, and side slopes of 2V on 1H, critical flow occurs at a depth of 1m. What will be the quantity of flow and the flow velocity? Take g as 10m/s^2

A. 7.22 m^3/s and 3.10 m/s   B. 6.82 m^3/s and 2.89 m/s

C. 7.22 m^3/s and 2.89 m/s   D. 6.82 m^3/s and 3.10 m/s

Ans. C

Sol.

B = 2 m

Depth of y$_c$= 1 m

Area, A

$$=\frac{1}{2}\times(B+B+y)\times y$$

$$=\frac{1}{2}\times(2+2+1)\times 1$$

$$=2.5m^2$$

Top width, T = 3 m

For critical flow F$_r$ = 1

$$\frac{V}{\sqrt{gA/T}} = 1 \Rightarrow V = \sqrt{9.81\times\frac{2.5}{3}}$$

Velocity,V = 2.86m/sec

Discharge, Q = VA = 2.86 × 2.5

Q = 7.15 m^3/s

Hence Answer is C

12. For a hydraulically efficient rectangular channel of bed width 5m, the hydraulic radius is

A. 0.5m   B. 1.25m

C. 2.75m   D. 4.25m

Ans. B

Sol. For a hydraulically efficient rectangular channel, hydraulic radius = $\frac{y}{2}$ and B = 2y for

hydraulically efficient channel

$$\therefore R = \frac{B}{2 \times 2} = \frac{B}{4} = \frac{5}{4} = 1.25m$$

13. At a hydraulic jump, the depths at its two sides are 0.3 m and 1.2m. The head loss in the jump is

A. 1.0m   B. 0.8m

C. 0.5m   D. 0.45m

Ans. C

Sol.

$$E_L = \frac{(y_2 - y_1)^3}{4y_1y_2}$$

$$= \frac{(1.2 - 0.3)^3}{4 \times 1.2 \times 0.3}$$

$$= 0.50 \ m$$

14. A centrifugal pump has its impeller of 50 cm diameter at inlet, and it rotates at 1200 rpm. The tangential velocity of the impeller at the inlet is

A. 16 πm/s   B. 10 πm/s

C. 12πm/s   D. 100 πm/s

Ans. B

Sol. Tangential velocity

$$= \frac{\pi DN}{60} = \frac{\pi \times 50 \times 10^{-2} \times 1200}{60} = 10 \ \pi m/sec$$

15. Depth-Area-Duration curves of precipitation at a station would normally be

A. curves, concave upwards, with duration increasing outward

B. curves, concave upwards, with duration decreasing outward

C. curves, concave downwards, with duration decreasing outward

D. curves, concave downwards, with duration increasing outward

Ans. D

Sol. option (d) is correct

DAW curve: It is used to find out now much of rainfall will occur in an area by converting rainfall data to areal rainfall data.

Daw curve expresses graphically the relation between progressively decreasing average depth of rainfall over a progressively increasing area from the centre of the storm outward to its edges for a given duration of rainfall.

Option (d) – curve, concave downward, with duration increasing outward.

16. The 12-hr unit hydrograph of a catchment is triangular in shape with a base width of 144 hours and a peak discharge value of 23 m^3/s. The hydrograph refers to a catchment of area

A. 596km^2 B. 1000 km^2

C. 25km^2 D. 756 km^2

Ans. A

Sol. Correct option ; (A) 596km^2

Explanation:-

For a given catchment area a triangular 12hr unit hydrograph is considered.

Base, B = 144 hrs.

Peak discharge Q_{max} = 23m^3/s

$$\Delta h = \frac{0.36 \Sigma 0t}{A}$$

Where,

$\Sigma 0t$ is sum of area of hydrograph.

A is area in km^2

Δh = depth.

$$1 = 0.36 \times \frac{1}{2} \times \frac{B \times Q_{max}}{A}$$

$$\boxed{A = 596km^2}$$

17. A one day rainfall of 18 hours at station 'S' was found to have a return period of 50-years. The probability that a one day rainfall of this or will not occur at station 'S' during next 50-years is

A. 0.020　　　　　　　　　　　B. 0.395

C. 0.636　　　　　　　　　　　D. 0.364

Ans. D

Sol. Correct option (D) 0.364

For a station A, one day 18 hrs hair fall having return period of 50 years.

Probability of ascendence equalled = $P = \dfrac{1}{T}$

$= \dfrac{1}{50}$

Probability of not exceedance equalled $= 1 - \dfrac{1}{T} = 1 - \dfrac{1}{50} = \dfrac{49}{50}$

Probability of occurrence of this rainfall zero times is 50 years.

Will be $= n_{cr} p^r q^{n-r}$, $p = \dfrac{1}{50}, q = \dfrac{49}{50}$

$= \dfrac{50!}{(50-0)! \, 0!} \times \left(\dfrac{1}{50}\right)^0 \left(\dfrac{49}{50}\right)^{50-0}$

$= 0.364$

18. The scour velocity of the stream is the

A. Average velocity

B. Maximum velocity at any time during the year

C. Velocity which can move the particles of bed materials

D. Velocity at which a highway bridge is liable to be damaged

Ans. C

Sol. Scour is the removal of sediments such as sand and gravel from around bridge abutments or piers. It is caused by swiftly moving water. The velocity of water of which scouring may occur is known as scour velocity.

19. A reservoir which retains excess supplies during periods of peak flows and release them gradually during low flows:

A. Retarding reservoir　　　　　　B. Flood control reservoir

C. Distribution reservoir　　　　　D. Conservation reservoir

Ans. D

20. The first watering given to a crop, when the crop is a few centimeters high, is called

A. Paleo irrigation　　　　　　　B. Kor watering

C. Leaching　　　　　　　　　　D. None of the given answers

Ans. B

Sol. 1st water before sowing of seeds is known as Paleo irrigation and 1st watering after sowing of seeds is known as Kor watering.

21. Field capacity and optimum moisture content of a soil of density 1.3 g/cc are 28% is 16% respectively. If effective depth of root zone is 70 cm, water available for e evapotranspiration is

A. 25.4 cm B. 22.29 cm

C. 14.56 cm D. 10.92 cm

Ans. D

Sol. Available depth for evapotranspiration is given as

$$d_a = d_r \times \frac{\gamma d}{\gamma w}\big[FC - (OMC)\big]$$

where, d_a = availabe depth

d_r = root zone depth

$$d_a = 70 \times \frac{1.3}{1}\frac{[28-16]}{100} = 10.92 \text{ cm}$$

22. In design of alluvial channels, for computing mean velocity of flow, Kennedy used

A. Chezy's formula B. Manning's formula

C. Kutter's formula D. Bazin's formula

Ans. C

Sol. For computing mean velocity of flow in design of alluvial channels, Kennedy used Kutter's formula.

23. For mixed traffic conditions, rate of superelevation for horizontal highway curve of radius 500 m and a speed of 100 kmph is

A. 0.220 B. 0.089

C. 0.057 D. 0.0108

Ans. B

Sol. For mixed traffic condition,

$$e = \frac{V^2}{225R} = \frac{(100)^2}{225 \times 500} = 0.089$$

24. The maximum super elevation to be provided on a road curve is 1 in 15. If the rate of change of super elevation is specified as 1 in 120 and the road width including widening is 12 m then the minimum length of the transition curve is (when the outer edge is raised with respect to inner edge)

A. 180 m B. 125 m

C. 96 m D. 48 m

Ans. C

Sol.

$$e_{max} = \frac{1}{15}$$

$$N = 120$$

$$W + w_e = 12 \text{ m}$$

$$L = eN(W + W_e)$$

$$= \frac{1}{15} \times 120 \times 12 = 96 \text{ m}$$

25. Which of the following are methods of Speed and delay studies

    i. Pneumatic counter

    ii. riding check method

    iii. Photographic method

    iv. Magnetic detector

    A. ii and iii   B. ii, iii and, iv

    C. i, iii and iv   D. All of these

Ans. A

Sol. Methods of counting traffic volume:

    i. Pneumatic counter

    ii. Magnetic detector

    iii. Manual counting

    Method for speed and delay studies:

    i. Floating car method or riding check method

    ii. Vehicle number method

    iii. Interview method

26. Widening at curves provided to compensate the extra width occupied by a vehicle on the curve due to tracking of the rear wheels is called

    A. Mechanical widening   B. Psychological widening

    C. Super widening   D. Extra widening

Ans. A

Sol. Mechanical widening is provided to cater for off tracking of vehicles.

    Its value is given as $W_{lm} = \dfrac{nl^2}{2R}$.

27. Average free flow speed and the jam density observed on a road stretch are 80 km/h and 100 vehicles/km respectively. For a linear speed-density relationship, the maximum flow on the road stretch (in vehicles/h) is:

    A. 8000 veh/hour   B. 2000 veh/hour

    C. 1800 veh/hour   D. 2200 veh/hour

Ans. B

Sol. $q = U_{sf} * k_J/4 = 80*100/4 = 2000$ Veh/hr.

28. If the load Stresses are 24 kg/cm^2, warping stresses are 30 kg/cm^2 and frictional stresses are 25.5 kg/cm^2, then what would be the value of critical stresses combination (in kg/cm^2) at edge region during summer mid-day?

    A. 24   B. 54

    C. 28.5   D. 57

Ans. C

Sol. Summer mid day = load stress + warping stress – frictional stress

    = (24 + 30 – 25.5) kg/cm^2

    = 28.5 kg/cm^2

29. Minimum percentage of bitumen in cold mix bituminous material by total weight of mix should not be less than:

A. 3.5%

B. 2.5%

C. 5.0%

D. 4.5%

Ans. B

Sol. Minimum percentage of bitumen in cold bituminous mix design is 2.5%

30. Flattening and smoothing the road surface by scrapping is called

A. Compaction

B. Consolidation

C. Grading

D. Ditch digging

Ans. C

Sol. Compaction – Compaction means sudden removal of air.

Consolidation- Consolidation means expulsion of water and air (time-taking phenomenon).

Grading- Flattening and smoothing the road surface by scrapping.

Ditch digging- Forming a trench using excavation or other tools.

31. Equilibrium cant for a 3° curve on a Broad Gauge track, if the permitted speed is 70 kmph, is:

A. 18.85 cm

B. 16.20 cm

C. 15.85 cm

D. 11.25 cm

Ans. D

Sol. 11.25 cm

32. For the construction of a 640 m long B.G. railway track by using a sleeper density of M + 5, and the length of each rail is 12.8 m, the number of sleepers required will be

A. 1000

B. 900

C. 800

D. 700

Ans. B

Sol. Here, M = 13 m for B.G.

$$\therefore \text{Number of sleeper} = \frac{(m+5)}{12.8} \times L$$

$$\Rightarrow \text{Number of sleeper} = \frac{(13+5)}{12.8} \times 640 = 900$$

33. Cruising speed of aircraft is

A. speed of aircraft with respect to wind

B. speed of aircraft with respect to ground

C. speed of flight

D. speed of pilot

Ans. B

Sol. Cruising speed/ground speed - Aircraft speed with respect to ground when aircraft is in air at its maximum speed.

Air speed - Aircraft speed relative to wind.

34. Which of the following decides the width of taxiway?

A. Tail width

B. Fuselage length

C. Wheel base

D. Wing span of aircraft

Ans. D

Sol. Width of taxiway in much lower than runway

- Since speed at taxiway is lower, so pilot can comfortably manoeuvre the aircraft over small width than runway.

- Normally varies from 22.5 m to 7.5 m depending upon wing span of aircraft.

35. Zero hardness of water is achieved by

A. Lime-soda process

B. Ion exchange treatment

C. Excess lime treatment

D. Excess alum dosage

Ans. B

Sol. → In ion exchange method we use zeolites which are hydrated silicates of sodium and aluminium. Which reacts as following:

$$Naz + \overset{ca}{\underset{Mg}{}} \begin{Bmatrix} HCO_3^- \\ SO_4^{2-} \\ Cl^- \end{Bmatrix} \rightarrow Na \begin{Bmatrix} HCO_3^- \\ SO_4^{2-} \\ Cl^- \end{Bmatrix} + \begin{Bmatrix} Ca \\ Mg \end{Bmatrix} Z$$
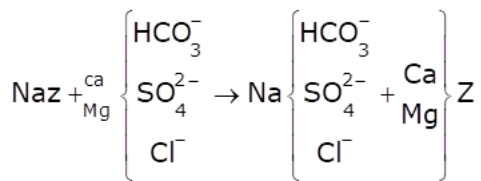
36. Five-days BOD of a 10% diluted sample having $D_0 = 6.7$ mg/l, $D_s = 2$ mg/l and consumption of oxygen in blank = 0.5 mg/l, will be

A. 22 mg/l

B. 42 mg/l

C. 62 mg/l

D. 82 mg/l

Ans. B

Sol. D_0 = Initial D.O. of mix = 6.7 mg/l

D_s = Final D.O of mix = 2 mg/L

Consumption of oxygen in blank sample = 0.5 mg/L

Dilution ratio (P) = 0.1

As the mixture uses seeded water

$$BOD_5 \frac{(D_0 - D_s) - (D_{ob} - D_{sb}) \times (1 - P)}{P}$$

$$= \frac{(6.7 - 2) - 0.5 \times 0.9}{0.1}$$

= 42.5 mg/l

So, nearest option will be B.

37. Which one of the following statements related to testing of water for municipal use is correctly applicable?

A. Pseudo-hardness is due to presence of fluoride in water

B. When alkalinity Â total hardness, Carbonate hardness in mg/l = Total hardness in mg/l

C. Bicarbonate alkalinity = total alkalinity – (carbonate alkalinity – hydroxide alkalinity)

D. Hydroxide alkalinity = Carbonate alkalinity + Bicarbonate alkalinity

Ans. B

Sol. → If non-carbonate hardness is absent in water

Â Total hardness = minimum (carbonate hardness, alkalinity)

Thus, Alkalinity > Total hardness then total hardness = carbonate hardness.

→ Pseudo hardness is due to pressure of Na+ (sodium) ion in water.

→ Bicarbonate alkalinity = Total alkalinity – [carbonate alkalinity + hydroxide alkalinity]

38. Consider the following statements regarding waste stabilization ponds:

1) The pond has a symbiotic process of waste stabilization through algae on one hand and bacteria on the other

2) The oxygen in the pond is provided by algae through photosynthesis

3) The detention period is of the order of two to three days

4) The bacteria which develop in the pond are aerobic bacteria Which of the above statements are correct?

A. 1 and 2 only   B. 2 and 3 only

C. 3 and 4 only   D. 1 and 4 only

Ans. A

Sol. → Stabilization pond has symbiosis between algae and bacteria. In which algae produces oxygen by photosynthesis and aerobic bacteria consumes that → Stabilization pond used for domestic sewage are mostly facultative in nature → Stabilization pond has detention period around 15 –30 days

39. The purpose of re-carbonation after water softening by the lime-soda process is the

A. Removal of excess soda from the water

B. Removal of non-carbonate hardness in the water

C. Recovery of lime from the water

D. Conversion of precipitates to soluble forms in the water

Ans. D

Sol. → Complete removal of hardness cannot be accomplished by chemical precipitation. These remains will precipitate slowly and hence will get accumulated inside the pipe and clog the pipe with time. Hence it is necessary to make it soluble.

And this is done by adding 'CO_2' in water.

40. The moisture content of a certain Municipal Solid Waste with the following composition will be

	Wet, % weight	Dry, % weight
Food waste	10	03
Paper	35	30
Yard waste	20	10
Others	35	20

A. 100%   B. 63%

C. 37%   D. 13%

Ans. C

Sol. Total weight = (10+ 35 + 20 + 35) = 100 units

Dry weight = (63 + 30 + 10 + 20) = 63 units

Thus, moisture = (100 – 63) = 37 units.

% moisture content = 37%

41. Statement (I) : Proximate analysis of MSW is carried out to determine moisture content, volatile matter, and fixed carbon.

Statement (II) : Ultimate analysis of MSW is carried out to determine the full range of chemical composition and the energy value.

A. Both Statement (I) and Statement (II) are individually true and Statement (II) is the correct explanation of Statement (I)

B. Both Statement (I) and Statement (II) are individually true but Statement (II) is not the correct explanation of Statement (I)

C. Statement (I) is true but Statement (II) is false

D. Statement (I) is false but statement (II) is true

Ans. B

Sol. Correct option is B.

I. Proximate analysis of 'municipal solid waste' is carried out to determine.

(i) Moisture

(ii) Volatile matter

(iii) Ash

(iv) Fixed carbon

II. Ultimate analysis of solid waste is used to characterize the chemical composition of organic matter. They are also used to define the proper mix of solid waste materials to achieve suitable C/N ratios for bio-conversion processes.

42. An error in observations of either fore or back bearing or both may be due to

A. Magnetic declination   B. Dip

C. Local attraction   D. Inclination

Ans. C

Sol. During for bearing or back bearing calculation, magnetic compass is used which may show erroneous results if some metal strip or small magnet is lying nearby. This type of error is known as local attraction.

43. Adjustment of Focusing screw of a theodolite enables getting

A. clear image of objects   B. clear image of cross-hairs

C. clear image if diaphragm   D. clear vision of stadia lines

Ans. A

Sol. To obtain clear image of objects, focussing is to be done which is a temporary adjustment of theodolite.

(D) Focussing of eyepiece lens: For focusing of the eye piece, point the telescope to the sky or hold a piece of white paper in front of telescope. Move the eye-piece in and out until a distinct sharp black image of the cross hairs is seen. This confirms proper focussing. To clearly view the object being sighted, focus the objective lens.

(ii) Focussing of objective lens: It is done for each independent observation to bring the image of the object in the plane of cross hairs.

44. In trigonometrical leveling reciprocal observation eliminates

    A. Instrumental error   B. Refraction error

    C. Gross Error   D. Compensating error

Ans. B

Sol. Reciprocal levelling eliminates errors due to effect of collimation, refraction and curvature of earth.

45. Satellite station is related with

    A. Control survey   B. Mining Survey

    C. Topographical survey   D. Levelling

Ans. A

Sol. **Satellite station:** A false station at which observation is taken for other point, but later its reading is transferred to true station (impossible to set up station) is called satellite station (false station).

46. Recently SIDBI collaborated with which state government for development of MSMEs?

    A. Manipur   B. Tripura

    C. Assam   D. Nagaland

    E. Arunachal Pradesh

Ans. C

Sol. * The Small Industries Development Bank of India (SIDBI) has participated in a special event held at the Administrative Staff College, Guwahati, Assam, to strengthen the state co-operation.

47. With which country India has signed a three-year Work Program for development in Agriculture cooperation?

    A. France   B. Japan

    C. Israel   D. Germany

    E. Canada

Ans. C

Sol. • India & Israel have signed a three-year 5th Indo-Israel Agriculture Action Plan (IIAP) 2021-23 agreement for development in Agriculture cooperation.

    • Under the work program, both countries will implement two initiatives namely 'Indo-Israel Agricultural Project Centre of Excellence' & 'Indo-Israel Villages of Excellence (IIVoE)'.

    • It will benefit local farmers both through the Centers of Excellence and the Villages of Excellence.

    • Under the IIAP, 29 CoEs have been established across India in 12 states.

    • The COEs established under these Israeli-based action plans are playing an important role in doubling farmers' income.

    • The exchange of technology between India and Israel will greatly improve the productivity and quality of horticulture.

48. First batch of Multi-Mode Hand Grenades (MMHG) has been handed over to Indian Army in Nagpur, Maharashtra. The MMHG is manufactured by _____.

    A. BEML Limited   B. Economic Explosives Limited (EEL)

    C. Bharat Dynamics Limited   D. Bharat Electronics Limited

    E. Bharat Heavy Electricals Limited

Ans. B

Sol. * First batch of Multi-Mode Hand Grenades (MMHG) has been handed over to Indian Army in Nagpur, Maharashtra

    * MMHG is manufactured by Economic Explosives Limited (EEL), following Transfer of Technology from Terminal Ballistics Research Laboratory of DRDO

    * Grenade is lethal, safer and has a distinctive design that gives flexibility of employment in both defensive (fragmentation) and offensive (stun) modes.

    * It has a highly accurate delay time, very high reliability in usage and safe for carriage.

49. Defence Research and Development Organisation (DRDO) has handed over the first deliverable Firing Unit (FU) of Medium Range Surface to Air Missile (MRSAM) System to Indian Air Force (IAF). The missile has been jointly developed by DRDO and which aerospace manufacturer?

    A. Israel Aerospace Industries   B. Lockheed Martin Corporation

    C. The Boeing Company   D. MBDA

    E. Airbus Group

Ans. A

Sol. • Defence Research and Development Organisation (DRDO) has handed over the first deliverable Firing Unit (FU) of Medium Range Surface to Air Missile (MRSAM) System to Indian Air Force (IAF).

    • MRSAM is an advanced network centric combat Air Defence System. It was jointly developed by DRDO and Israel Aerospace Industries (IAI) in collaboration with Indian industry consisting of private and public sectors as well as MSMEs. It is a surface-to-air-missile, 4.5m in length. Contract for MRSAM programme was signed in February 2009. Under the contract, IAF was to buy 450 MRSAMs and 18 firing units at the value of $2bn.

50. Which act ended the "Trade Monopoly" of the East India Company?

    A. Regulating Act of 1773   B. Pitt's India Act of 1784

    C. The Charter Act of 1833   D. The Charter Act of 1813

Ans. D

Sol. It was the charter act of 1813 that ended the "Trade Monopoly" of the East India Company. However the company was allowed to continue their monopoly over the tea trade and the trade with China.

51. Apart from the Himalayan region, the forest soils occur which of the following?

    A. Western Ghats   B. Eastern Ghats

    C. Southern Ghats   D. Both A and B

Ans. D

Sol. Apart from the **Himalayan region**, the **forest soils** occur on **Western** and **Eastern Ghats** as well as in some parts of the **Peninsular plateau**.

52. In which year was Nationalist Congress Party (NCP) founded?

A. 1949   B. 1999

C. 1972   D. 1997

Ans. B

Sol. Nationalist congress party was founded on 25 may 1999. Its youth wing is the nationalist youth congress . Sharad pawar, P.A. Sangma and Tariq Anwar were the three leaders who were involved. Sharad Pawar was made the president and P.A. Sangma and Tariq Anwar were made the General Secretaries of NCP. NCP was declared as a National party by the Election commission of India.

53. Which of the following is related to Saffron Energy Revolution ?

A. Milk   B. Petroleum

C. Solar Energy   D. Fish Production

Ans. C

Sol. The **'Saffron Energy Revolution'** is related to promotion and better utilisation of **Solar Energy**.

• The Saffron Revolution that focuses on renewable energy sources such as solar energy.

• This Revolution was announced by **Prime Minister Narendra Modi** in **June**, **2014**.

• Its aimed at making India a solar energy hub and offered its cooperation in the renewable energy sector.

54. Where does the Tricarboxylic acid cycle, take place?

A. Mitochondria   B. Centrosome

C. Centrioles   D. Vacuoles

Ans. A

Sol. Tricarboxylic acid cycle takes place in the **mitochondria**. **Tricarboxylic acid cycle,** which is **TCA cycle** also called **Krebs cycle** and **citric acid cycle**. The second stage of **cellular respiration** and the three-stage process by which living **cells break** down organic fuel molecules in the presence of oxygen to harvest the energy they need to grow and divide. In the cytoplasm, Glycolysis **takes place** . Within the mitochondrion, the **citric acid cycle occurs in the mitochondrial matrix**, and oxidative metabolism **occurs** in the internal folded **mitochondrial** membranes (cristae).

55. Which of the following districts come under Devipatan Division of Uttar Pradesh?

A. Bahraich, Gonda, Balarampur, Shravasti

B. Balarampur, Basti , Sant kabir Nagar, Shravasti

C. Shravasti, Gonda , Santkabir Nagar, Balrampur

D. Gonda, Bahraich Santkabir Nagar, Shravasti

Ans. A

Sol. In Uttar Pradesh state of India, Devipatan division is an administrative geographical unit. Gonda is headquarters of this division. It consists –

1) Gonda,

2) Bahraich,

3) Shravasti, and

4) Balarampur.

56. In which of the following districts of Uttar Pradesh is Ayodhya, the birth place of Ram situated?

A. Varanasi   B. Meerut

C. Faizabad   D. Kanpur

Ans. C

Sol. Ayodhya is also known as Saketa, is an ancient city of India, believed to be the birthplace of Rama and setting of the epic *Ramayana*. It is adjacent to Faizabad city in the central region of the Indian state of Uttar Pradesh. Ayodhya used to be the capital of the ancient Kosala Kingdom. It has an average elevation of 93 meters (305 feet).

57. Who is the Minister of Power in Uttar Pradesh Government?

A. Dinesh Sharma   B. Dharmpal Singh

C. Shrikant Sharma   D. Jai Pratap Singh

Ans. C

Sol. Shrikant Sharma is an Indian politician from the BJP. He is a Member of the Uttar Pradesh Legislative Assembly from Mathura Constituency in Mathura district. He was sworn in as a Minister of Power in Yogi Adityanath cabinet. He is also the head of Bharatiya Janata Party National Secretary.

58. Which district of Uttar Pradesh is going to get India's first freight village?

A. Kannauj   B. Varanasi

C. Bijnor   D. Mainpuri

Ans. B

Sol. India's first 'freight village' will be developed by the Inland Waterways Authority of India (IWAI) in Varanasi, Uttar Pradesh. The freight village, a one-of-its-kind infrastructure platform, will attract companies that require logistics services and can cluster to improve their competitiveness. This will allow relocation of retailers, warehouse operators and logistics service providers supplying the regional FMCG market. The facility will come around the proposed multi-modal terminal adjacent to the city on the banks of the Ganga.

59. **Direction**: Select the one which is different from the other three responses.

A. 704, 11   B. 256,4

C. 832, 13   D. 310,5

Ans. D

Sol. 704 ÷ 11 = 64

256 ÷ 4 = 64

832 ÷ 13 = 64

But, 310 ÷ 5 = 62

Thus, the odd one is 310, 5.

Hence, option D is correct.

60. 5kg of Rice at Rs.4 per kg is mixed with 10kg of rice at Rs.5 per kg. find the average price of the mixture.
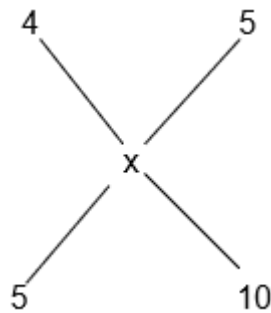
A. 3.6   B. 5.8

C. 6.4   D. 4.6

Ans. D

Sol. Let the average price of the rice be x,

Then,

(5-x) =(x-4)

→ (5-x)/(x-4) = 5/10

→ 50-10x=5x-20

→ 70=15x

→ x=4.66

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