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UPSC ENGINEERING SERVICES - 2017

ESE 2017 - PRELIMS

GENERAL STUDIES & APTITUDE

Questions with Detailed Solutions

VIDEO SOLUTIONS FOR ESE - 2017

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SET - A



UPSC Engineering Services - 2017 (Prelims)

General Studies and Engineering Aptitude [SET - A]

01. Which of the following methods are considered as most favourable to production organizations liable for Taxation?

- i. Straight line method of depreciation
- ii. Declining balance method of depreciation
- iii. Sum of the years digits method of depreciation
- iv. Sinking fund method of depreciation

Select the *correct* answer using the codes given below:

- (a) i and ii (b) ii and iii (c) iii and iv (d) iv and i

01. Ans: (a)

The most commonly used method for calculating depreciation under generally accepted accounting principles is the “Straight line Method”. This method is the simplest to calculate the taxes while filing tax returns.

The other accepted method is “declining balance method”.

02. Consider the following statements regarding Repo rate:

- i. It is the rate at which RBI lends money to Commercial Banks generally against Government Securities.
- ii. It is the rate at which RBI borrows money from Commercial Banks generally against Government Securities.
- iii. It is the rate at which Commercial Banks keep Deposits with RBI

Which of the above statements is/are correct?

- (a) i only (b) ii only (c) iii only (d) i, ii and iii

02. Ans: (a)

Repo rate is the rate at which the central bank of a country (Reserve bank of India) lends money to commercial banks in the event of any shortfall of funds.



Current Repo rate : 6.25%

Statement 2 is Reverse repo

Statement 3 is Cash reserve Ratio

03. Consider the following statements regarding GST:

- i. The GST Bill 2014 has the purpose to improve the Value Added Tax on Goods and Services.
- ii. It can be imposed differently in different States.
- iii. It is a Comprehensive Tax imposed nationwide irrespective of any State concerned.
- iv. It is a significant step in the reform of Indirect Taxation in India.

Which of the above statements are *correct*?

- (a) i, ii and iii (b) i, ii and iv (c) ii, iii and iv (d) i, iii and iv

03. Ans: (d)

GST is single indirect tax for the whole nation, which will make India one unified common market.

It is a single tax on the supply of goods and services, right from the manufacturer to the consumer.

NEW BATCHES FOR

ESE – 2017 Stage – II (Mains)

BATCH - 1	BATCH - 2
18 th Jan 2017 (E&T, EE, CE & ME)	9 th Feb 2017 (E&T & ME)
	15 th Feb 2017 (EE & CE)

ESE - 2017 MAINS OFFLINE TEST SERIES
WILL BE CONDUCTED FROM MARCH 1ST WEEK
DETAILED SCHEDULE WILL BE ANNOUNCED SOON



04. Consider the following statements:

Vision of Digital India launched by the Government of India is centred on

- i. Digital infrastructure as a utility only to senior citizens.
- ii. Governance and Services on demand
- iii. Digital Empowerment of every citizen

Which of the above statements are *Correct*?

- (a) i, ii and iii (b) i and ii only (c) i and iii only (d) ii and iii only

04. Ans: (d)

The Government of India has approved the 'Digital India' programme with the vision to transform India into a digitally empowered society and knowledge economy.

The Digital India programme is centered on three key vision areas and 9 pillars:

Vision Areas of Digital India

1. Digital Infrastructure as a Core Utility to Every Citizen
2. Governance and Services on Demand
3. Digital Empowerment of Citizens

First statement is wrong because it says Digital Infrastructure as a utility **only** to senior citizens.

05. The words 'Satyameva Jayate' inscribed below the base plate of the Emblem of India have been taken from which one of the following?

- (a) Mundaka Upanishad (b) The Rig Veda
(c) The Bhagavad Gita (d) Vaalmeiki's Ramayana

05. Ans: (a)

Satyameva Jayate is a mantra (3.1.6) from the ancient Indian scripture Mundaka Upanishad. Upon Independence, it was adopted as a motto of India.



06. Which one of the following Committees was set up by the Government of India in September 2014 to restructure the Railways and to suggest ways for resources mobilization?

- (a) Bibek Debroy Committee
- (b) C. Rangarajan Committee
- (c) Parthasarathi Shome committee
- (d) Sundar Committee

06. Ans: (a)

As part of the restructuring of the Indian railways, a committee has been set up headed by NITI Aayog member, Bibek Debroy. The Bibek Debroy Committee is a high level committee for “Mobilization of Resources for Major Railway Projects and Restructuring of Railway Ministry and Railway Board”.

- C Rangarajan Committee: On Poverty estimation.
- **Parthasarathi Shome: The 7-member Tax Administration Reform Commission (TARC)**
- Sundar committee: On road safety and traffic management.

OUR ESE 2016 TOP 10 RANKERS IN ALL STREAMS

E&T	EE	CE	ME
1. E&T	2. EE	2. CE	1. ME
2. E&T	3. EE	4. CE	2. ME
3. E&T	4. EE	6. CE	3. ME
4. E&T	5. EE	8. CE	8. ME
5. E&T	6. EE	9. CE	9. ME
6. E&T	8. EE	10. CE	
7. E&T	9. EE		
8. E&T	10. EE		
9. E&T			
10. E&T			
10 IN TOP 10 RANKS	8 IN TOP 10 RANKS	6 IN TOP 10 RANKS	5 IN TOP 10 RANKS

29 RANKS IN TOP 10 IN ESE-2016

72% OF STUDENTS IN TOP 10 ARE FROM **ACE** and many more...



07. The Rotterdam Convention deals with

- (a) Reducing nuclear weapon stock piles (b) Limiting the use of toxic chemicals
(c) Protecting the oceans (d) Banning of human clone experiment

07. Ans: (b)

08. A pentagonal prism is lying on HP on one of its rectangular faces. When it is cut by a section plane, the largest possible section thereof has

- (a) Five edges (b) Six edges (c) Seven edges (d) Eight edges

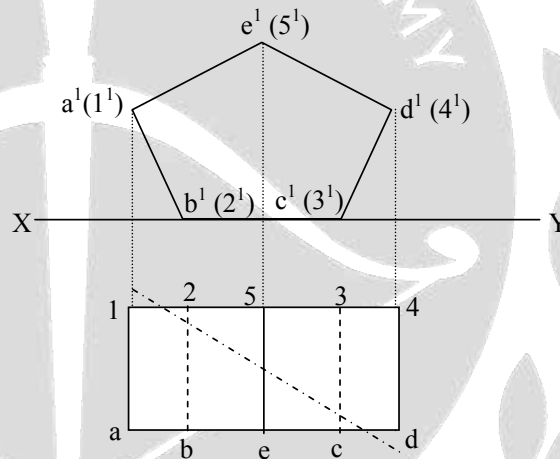
08. Ans: (c)

Front base edges = 2(c-d, d-e)

Rare base edges = 2(1-2, 1-5)

Longer edges = 3(2-b, 5-e, 3-c)

Total 7 edges.



09. Consider the following tertiary treatment methods for treatment of waste water:

- i. Ion-exchange method
- ii. Reverse osmosis
- iii. Chemical oxidation method
- iv. Activated sludge process

Which of the above methods are *correct*?

- (a) i, ii and iv (b) i, iii and iv (c) ii, iii and iv (d) i, ii and iii

09. Ans: (d)

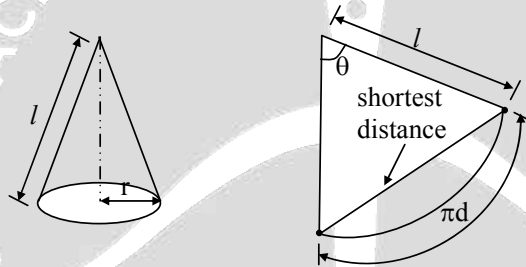
Activated sludge process is a secondary treatment but not tertiary treatment.



10. If a thread is wound around a cone, starting from a point on the base, and brought back to the same point, then the shortest possible length of the thread is equal to the
- (a) Diameter of the base of the cone
 - (b) Slant height of the cone
 - (c) Largest chord of the development sector
 - (d) Length of the perpendicular from a corner of the development sector to the opposite edge

10. Ans: (c)

Sol: Largest chord of the development sector.



11. Three hundred Passengers are traveling in white, silver and black cars; each of these cars is carrying 6, 5 and 3 passengers, respectively. If the number of white and silver cars is equal and there is only one black car, what is the total number of cars?
- (a) 52
 - (b) 53
 - (c) 54
 - (d) 55

11. Ans: (d)

Sol: Total No. of passengers = 300

In white car no. of passengers = 6

In silver car no. of passengers = 5

In black car no. of passengers = 3

The no. of white cars = No. of silver = x

Black car = 1 No

No. of passengers in white and silver



$$= 300 - 3 = 297$$

$$6x + 5x + 3 = 300$$

$$11x = 297$$

$$x = 27$$

$$\therefore \text{Total no of cars} = 27 + 27 + 1 = 55$$

Alternative Method

Let, no. of white & silver cars = 'x' each

Now, total no. of passengers = 300

$$\text{i.e., } 6(x) + 5(x) + 3(1) = 300$$

[only 1 black car with 3 passengers]

$$\therefore x = 27$$

i.e., white cars = 27

Silver cars = 27

Black = 1

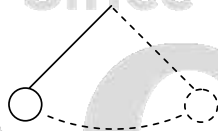
Total cars = 55

12. The locus traced by a point moving along a pendulum from one end to another, when the pendulum oscillates is
- (a) A spiral (b) An involute (c) A cycloid (d) A helix

12. Ans: (a)

Sol:

Since 1995



Spiral: If a line rotates in a plane about one of its ends and the same time, if a point moves along the line continuously in one direction, the curve traced out by the moving point is called a spiral.



13. The present ages of 3 brothers are in the proportion 3 : 4 : 5. After 10 years the sum of their ages will be 78. What are their ages now?

- (a) 12, 16 and 20 (b) 15, 20 and 25 (c) 21, 28 and 35 (d) 24, 32 and 40

13. Ans: (a)

Sol:

$$\begin{array}{l} \text{P} \Rightarrow 3 : 4 : 5 \\ \text{After 10 yrs} \left\{ \begin{array}{l} 3x + 10 : 4x + 10 : 5x + 10 \end{array} \right. \end{array}$$

$$3x + 10 + 4x + 10 + 5x + 10 = 78$$

$$12x + 30 = 78$$

$$12x = 48$$

$$x = 4$$

Their ages Now

$$3 \times 4 : 4 \times 4 : 5 \times 4$$

$$12 : 16 : 20$$

Alternative Method

Let their Present ages be $3x$, $4x$ & $5x$ years represents

Now, sum of their ages after 10 years = 78

$$\text{i.e., } (3x+10) + (4x+10) + (5x+10) = 78$$

$$\therefore x = 4 \text{ years}$$

Then, their Present ages are 12, 16 & 20 years represents

14. A total of 324 notes comprising of Rs.20 and Rs 50 denominations make a sum of Rs.12,450. The number of Rs.20 notes is

- (a) 200 (b) 144 (c) 125 (d) 110



14. Ans: (c)

Sol: Total No. of notes = 324

No. of notes of Rs.20 = x

No. of notes of Rs.50 = y

$$x + y = 324 \text{ -----(i)}$$

$$20x + 50y = 12,450 \text{ -----(ii)}$$

Equation no (i) multiplied with 50 $50x + 50y = 324 \times 50 \text{ -----(iii)}$

By solving equation (ii) & (iii)

$$20x + 50y = 12,450$$

$$50x + 50y = 16,200$$

$$\underline{\quad\quad\quad} \quad \underline{\quad\quad\quad}$$

$$+ 30x \quad = + 3750$$

$$x = 125$$

∴ The number of Rs 20 notes = 125

Alternative Method

Let, no.of 20 rupee notes = x

Then, no.of 50 rupee notes = (324 - x)

Now, $20(x) + 50(324 - x) = 12,450$

$$\therefore x = 125$$

15. Consider the following factors in making ethical judgement:

- i. The motive from which the action springs
- ii. The nature of the act itself, including the means adopted
- iii. The resulting consequences

Which of the above factors are *correct* ?

- (a) 1 and 2 only (b) 1 and 3 only (c) 1, 2 and 3 (d) 2 and 3 only



15. Ans: (c)

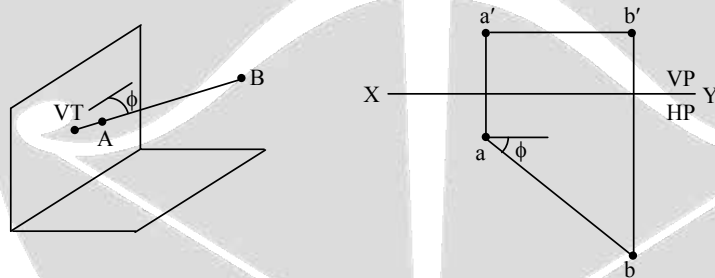
Ethical judgment is the sum total of three components under the options given, viz., motivation behind the action, the action taken and the approach to the action, along with the consequences of the action.

16. If a line is inclined to Vertical Plane and parallel to Horizontal Plane, then which of the following statements is always *correct*?

- (a) True Length = Plane Length (b) True Length = Elevation Length
(c) True Length < Plane Length (d) Vertical Trace of the line is above the XY plane

16. Ans: (a)

True length = Plan length



17. If the radius of a generating circle which is moving inside the directing circle is half of the radius of the directing circle, the curve generated by a point on the circumference of the generating circle is

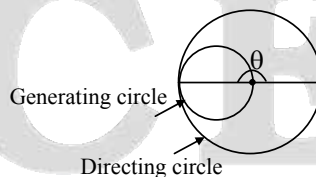
- (a) A circle (b) An ellipse (c) A straight line (d) A spiral

17. Ans: (c)

A straight line.

$$\theta = \frac{r}{R} \times 360^\circ = \frac{d}{D} \times 360^\circ$$

$$d = \frac{D}{2} \quad \text{or} \quad r = \frac{R}{2}$$



Since $R = 2r$ then $\theta = 180^\circ$



18. If the development of the lateral surface of a cone is a semicircle, then

- (a) The slant height of the cone < diameter of the base of the cone
- (b) The slant height of the cone > diameter of the base of the cone
- (c) The slant height of the cone = diameter of the base of the cone
- (d) The slant height of the cone = radius of the base of the cone

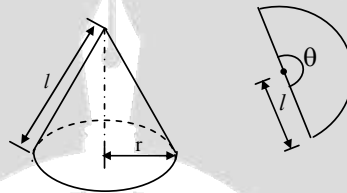
18. Ans: (c)

The slant height of the cone = diameter of the base of the cone.

$$\theta = \frac{r}{l} \times 360^\circ$$

$$(\because l = d = 2r)$$

$$\theta = 180^\circ$$



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29TH APRIL 2017

06TH MAY 2017

13TH MAY 2017

18TH MAY 2017

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19. Five Men can paint a building in 20 days, 8 Women can paint the same building in 25 days and 10 Boys can paint it in 30 days. If a team has 2 Men, 6 Women and 5 Boys, how long will its take to paint the building?

- (a) 12 days (b) 13 days (c) 14 days (d) 15 days

19. Ans: (d)

5 Men → 20 days, 1 Men = $20 \times 5 = 100$ days

$$1 \text{ day} = \frac{1}{100} \text{ th}$$

8 Women → 25 days, 1 Women = 25×8

$$= 200 \text{ days, } 1 \text{ day} = \frac{1}{200} \text{ th}$$

100 Boys → 30 days, 1 Boy = 30×100

$$= 300 \text{ days, } 1 \text{ day} = \frac{1}{300} \text{ th}$$

2 Men + 6 Women + 5 Boys = ?

$$1 \text{ day} \Rightarrow 2\left(\frac{1}{100}\right) + 6\left(\frac{1}{200}\right) + 5\left(\frac{1}{300}\right)$$

$$= \frac{6+9+5}{300} = \frac{1}{15} \text{ th}$$

∴ 15 days

Alternative Method

5 man → 20 days

Then, 1 man → ? (100 days)

8 women → 25 days

Then, 1 women → ? (200 days)



10 boys → 30 days

Then, 1 boy → ? (300 days)

$$\text{Work done by the team in are day} = \left(\frac{2}{100} + \frac{6}{200} + \frac{5}{300} \right) \text{ or } \frac{1}{15}$$

i.e., in 1 day, the team can do $\frac{1}{15}$ th of the total work.

∴ total time taken to complete the work in 15 days.

20. The Ethical skills are:

- (a) Care of possessions, modesty, posture, self-reliance, tidy appearance
- (b) Good behaviour, good manners, good relationships, good environment
- (c) Attention, calmness, concentration, self-confidence, self-esteem
- (d) Code of conduct, responsibility, efficiency, perseverance, punctuality

20. Ans: (d)

There are five core universal human values –

- 1. Self help skills covered by option 'a' in the question
- 2. Social Skills covered by option 'b' in the question
- 3. Peace Skills covered by option 'c' in the question
- 4. Ethical Skills covered by option 'd' in the question

21. Rajiv spends 40% of his salary on food 20% on house rent, 10% on entertainment and 10% on conveyance. If his saving at the month end are Rs. 2000, then his monthly salary is

- (a) Rs 6000 (b) Rs 8000 (c) Rs 10,000 (d) Rs 12,000

21. Ans: (c)

$$\text{Total Expenditure} = 40 + 20 + 10 + 10 = 80\%$$

$$\text{Savings} = 100\% - 80\% = 20\%$$

$$\text{Saving amount} = \text{Rs } 2000/-$$



$$20\% = 2000$$

$$1\% = \frac{2000}{20} = 100$$

$$100\% = ?$$

$$100 \times 100 = \text{Rs } 10,000$$

Alternative Method

Food = 40% of salary

House rent = 20% of salary

Entertainment = 10% of salary

$$20\% = 2000 \text{ Rs}$$

Convergence = 105 of salary

$$100\% = ?(10,000 \text{ Rs})$$

∴ Total exp = 80% of salary

Then, savings = 20% of salary

i.e., 2000 = 0.2 × salary

∴ Salary = Rs.10,000

22. A group of workers estimate to finish a work in 10 days, but 5 workers could not join the work. If the rest of them finished the work in 12 days, the number of members present in the team originally is
- (a) 50 (b) 45 (c) 35 (d) 30

22. Ans: (d)

x workers = 10 days

(x - 5) workers = 12 days

By Chain Rule

$$\frac{x \times 10 \times 1}{1} = \frac{(x - 5) \times 12 \times 1}{1}$$

$$10x = 12x - 60$$

$$2x = 60$$

$$x = 30$$

∴ The number of members present in the team originally = 30



Alternative Method

Let, initial no. of workers = x

$$\text{Now, } \frac{M_1 \times D_1 \times H_1}{W_1} = \frac{M_2 \times D_2 \times H_2}{W_2} \Rightarrow \frac{x \times 10 \times 1}{1} = \frac{(x-5) \times 12 \times 1}{1}$$

∴ x = 30 workers

23. The solution of the system of equations $x + y + z = 4$, $x - y + z = 0$, $2x + y + z = 5$ is

(a) $x = 2, y = 2, z = 0$

(b) $x = 1, y = 4, z = 1$

(c) $x = 2, y = 4, z = 3$

(d) $x = 1, y = 2, z = 1$

23. Ans: (d)

with back substitution method, verification of three equations with answers.

Method:

$$[AB] = \begin{bmatrix} 1 & 1 & 1 & 4 \\ 1 & -1 & 1 & 0 \\ 2 & 1 & 1 & 5 \end{bmatrix}$$

$$R_3 \rightarrow R_3 - 2R_1; \quad R_2 \rightarrow R_2 - R_1$$

$$\approx \begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & -2 & 0 & -4 \\ 0 & -1 & -1 & -3 \end{bmatrix}$$

$$R_3 \rightarrow 2R_3 - R_2$$

$$\approx \begin{bmatrix} 1 & 1 & 1 & 4 \\ 0 & -2 & 0 & -4 \\ 0 & 0 & -2 & -2 \end{bmatrix}$$

$$x + y + z = 4$$

$$-2y = -4 \Rightarrow y = 2$$

$$-2z = -2$$

$$\Rightarrow z = 1$$

$$\Rightarrow x = 1$$

$$x = 1; y = 2, z = 1$$

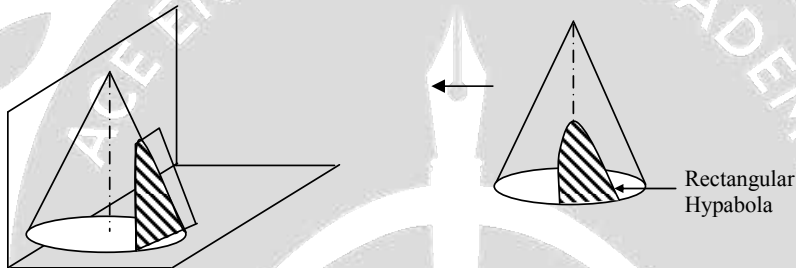


24. A cone is resting with its base on HP. A section plane parallel to VP cuts the cone. The section plane is some distance away from the centre and does not pass through the apex. The true shape of the section is

- (a) Hyperbola (b) Rectangular Hyperbola
(c) Parabola (d) Rectangular Parabola

24. Ans: (b)

Rectangular hyperbola.



Cutting plane parallel to Axis then the true shape of section is rectangular hyperbola.

25. The minimum value of the function $f(x) = \left(\frac{x^3}{3}\right) - x$ occurs at

- (a) $x = 1$ (b) $x = -1$ (c) $x = 0$ (d) $x = \frac{1}{\sqrt{3}}$

25. Ans: (a)

Sol: $f(x) = \frac{x^3}{3} - x$

Let $f'(x) = 0$

$\Rightarrow x^2 - 1 = 0$

$\Rightarrow x = \pm 1$

$f''(x) = 2x$

$f''(1) = 2 > 0$

$f(x)$ is minimum at $x = 1$



26. The complete integral of $(z - px - qy)^3 = pq + 2(p^2 + q)^2$ is

- (a) $z = ax + by + \sqrt[3]{pq + 2(p^2 + q)^2}$ (b) $z = ax + by + \sqrt[3]{ab + 2(a^2 + b)^2}$
 (c) $z = ax + by + \sqrt[3]{ab} + \sqrt[3]{2(a^2 + b)^2}$ (d) $z = ax + by + c$

26. Ans: (b)

Sol: $(z - px - qy)^3 = pq + 2(p^2 + q)^2$

$$z = px + qy + \sqrt[3]{pq + 2(p^2 + q)^2}$$

It is from Clairaut's form

$$z = ax + by + \sqrt[3]{ab + 2(a^2 + b^2)^2}$$

27. For the function $f(x) = \begin{cases} -2, & -\pi < x < 0 \\ 2, & 0 < x < \pi \end{cases}$

The value of a_n in the Fourier series expansion of $f(x)$ is

- (a) 2 (b) 4 (c) 0 (d) -2

27. Ans: (c)

Sol: $a_n = \frac{1}{\pi} \int_{-\pi}^{\pi} f(x) \cos nx \, dx = 0$

$\therefore f(x)$ is odd, $\cos nx$ is even

$\therefore f(x) \cos nx$ is an odd function

28. The solution of the following partial differential equation $\frac{\partial^2 u}{\partial x^2} = 9 \frac{\partial^2 u}{\partial y^2}$ is

- (a) $\sin(3x - y)$ (b) $3x^2 + y^2$ (c) $\sin(3x - 3y)$ (d) $(3y^2 - x^2)$



28. Ans: (a)

Given options are particular solutions so that it can be determine with back verification of Answers.

$$\text{Let, } u = \sin(3x-y)$$

$$\frac{\partial^2 u}{\partial x^2} = -9\sin(3x-y)$$

$$\frac{\partial^2 u}{\partial y^2} = -\sin(3x-y)$$

$$\frac{\partial^2 u}{\partial x^2} = 9 \frac{\partial^2 u}{\partial y^2}$$

29. If $W = \phi + i\psi$ represents the complex potential for an electric field.

Given $\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$, then the function ϕ is

(a) $-2xy + \frac{y}{x^2 + y^2} + C$

(b) $2xy + \frac{x}{x^2 + y^2} + C$

(c) $-2xy + \frac{x}{x^2 + y^2} + C$

(d) $2xy - \frac{y}{x^2 + y^2} + C$

29. Ans: (a)

$$\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$$

$$d\phi = \frac{\partial\phi}{\partial x} dx + \frac{\partial\phi}{\partial y} dy = \frac{\partial\psi}{\partial y} dx - \frac{\partial\psi}{\partial x} dy$$

$$\phi = \int \left(\frac{\partial\psi}{\partial y} dx - \frac{\partial\psi}{\partial x} dy \right) + C$$

$$\phi = \int \left(-2y - \frac{2xy}{(x^2 + y^2)^2} \right) dx - \int \left(2x + \frac{y^2 - x^2}{(x^2 + y^2)^2} \right) dy + C$$

(y constant) (free from x)

$$\phi = -2xy + \frac{2y}{(x^2 + y^2)} + C$$



30. The residue of $f(z) = \frac{z^3}{(z-1)^4(z-2)(z-3)}$ at $z=3$ is

- (a) -8 (b) $\frac{101}{16}$ (c) 0 (d) $\frac{27}{16}$

30. Ans: (d)

$$\begin{aligned} \text{Res}(f(z); z=3) &= \lim_{z \rightarrow 3} (z-3)f(z) \\ &= \lim_{z \rightarrow 3} (z-3) \frac{z^3}{(z-1)^4(z-2)(z-3)} \\ &= \frac{27}{(3-1)^4(3-2)} = \frac{27}{16} \end{aligned}$$

31. The value of the integral $\int_0^{2\pi} \left(\frac{3}{9 + \sin^2 \theta} \right) d\theta$ is

- (a) $\frac{2\pi}{\sqrt{10}}$ (b) $2\sqrt{10}\pi$ (c) $\sqrt{10}\pi$ (d) 2π

31. Ans: (a)

$$\int_0^{2\pi} \frac{3}{9 + \sin^2 \theta} d\theta = 2 \int_0^{\pi} \frac{3}{9 + \sin^2 \theta} d\theta$$

$$\left(\begin{array}{l} \because \int_0^{2a} f(x) dx = 2 \int_0^a f(x) dx \\ \text{When } f(2a-x) = f(x) \end{array} \right)$$

$$= 4 \int_0^{\pi/2} \frac{3}{9 + \sin^2 \theta} d\theta$$

Divided with $\cos^2 \theta$ both Numerator and Denominator



$$= 12 \int_0^{\pi/2} \frac{d\theta}{\cos^2 \theta (9 \sec^2 \theta + \tan^2 \theta)}$$

$$= 12 \int_0^{\pi/2} \frac{\sec^2 \theta d\theta}{9(1 + \tan^2 \theta) + \tan^2 \theta}$$

$$= 12 \int_0^{\pi/2} \frac{\sec^2 \theta d\theta}{9 + 10 \tan^2 \theta}$$

Put $\tan \theta = t$

$\sec^2 \theta d\theta = dt$

$$= \frac{12}{10} \int_0^{\frac{\pi}{2}} \frac{dt}{t^2 + \frac{9}{10}} = \frac{12}{10} \times \frac{1}{\sqrt{10}} \left(\tan^{-1} \left(\frac{t}{\sqrt{10}} \right) \right)_0^{\infty}$$

$$= \frac{4}{\sqrt{10}} \left(\frac{\pi}{2} - 0 \right) = \frac{2\pi}{\sqrt{10}}$$

32. Consider the following statements:

- i. The failure of many structures
- ii. Accidents on major highways
- iii. Discharge of effluents which pollute rivers
- iv. Dangerous gas emissions

These are attributable to:

1. Improper design
2. Not adhering to proper maintenance
3. Lack of proper inspection and quality control during construction
4. Corruption amongst several concerned individuals
5. Lack of public concern

Select the most appropriate answer using the codes given below:

- (a) 1, 2 and 3 only (b) 1, 2 and 4 only (c) 3, 4 and 5 only (d) 1, 2, 3, 4 and 5



32. Ans: (d)

1. Improper Design
2. Not Adhering to proper maintenance practices
3. Lack of proper inspection and quality control during construction
4. Corruption Amongst several concerned individuals
5. Lack of public concern.

- (i) The failure of many structures: 1, 2, 3, 4, 5
(ii) Accidents on major highways: 2, 3, 4, 5 (1)
(iii) Discharge of effluents which pollute rivers: 4, 5
(iv) Dangerous gas emissions: 1, 2, 4, 5

33. Consider the following statements regarding Golden Ratio for positive integers

1. It is the ratio of difference of two numbers and the smaller number
2. It is the ratio of sum of two numbers and the smaller number
3. It is the ratio of the sum of two numbers and the larger number

Which of the above statements is/are *correct*?

- (a) 1, 2 and 3 (b) 3 only (c) 2 only (d) 1 only

33. Ans: (b)

It is the ratio of sum of two numbers and the larger number.

34. For which of the following sectors do comprehensive safety and health statutes, for regulating Occupational Safety and Health (OSH) at work places, exist at present in India?

- (a) Mining, Factories, Ports and Agriculture
- (b) Factories, Mining, Agriculture and Construction
- (c) Mining, Factories, Ports and Construction
- (d) Factories, Ports, Agriculture and Construction



34. Ans: (c)

Nobody observes for safety in Agriculture

OSM → for 2012 - 2017

Mining sector, factories and docks and unorganized sector.

→ Occupational safety & Health planning commission document

→ Report of the working group on occupational safety and health for (2012-2017)

35. Consider the following statements regarding safety during demolition of the multi-storey building:

1. Demolition need not proceed storey by storey
2. Floor openings, not used for material chutes, should be enclosed with adequate guard rails
3. Before demolition starts all lath and loose plaster shall be stripped off throughout the building
4. Adequate and well-stiffened lateral bracing shall be provided for walls

Which of the above statements are *correct*?

- (a) 1, 2 and 3 only (b) 1 and 4 only (c) 2, 3 and 4 only (d) 1, 2, 3 and 4

35. Ans: (d)

Demolition of a multi-storey building

1. Demolition by hand
2. Demolition by ball
3. Demolition by pusher arm
4. Demolition by deliberate collapse
5. Demolition by wire rope pulling
6. Demolition by explosion or implosion
7. Demolition using grappler and shears
8. Demolition by high reach (or long-reach) excavators
9. Underwater demolition
10. Other methods



Statement given

1. Demolition need not proceed storey by storey
2. Floor openings, not used for material chutes, should be enclosed with adequate guard rail
3. Before demolition starts all lath and loose planter shall be stripped off through out the building
4. Adequate and well stiffened lateral bracing shall be provided for walls.

36. A clutch has to transmit 200Nm of torque. Assuming uniform pressure theory and the ratio of outer to inner radii is 2.5, what are the radii for a uniform pressure of 2MPa with the coefficient of friction of the liner material being 0.4?

- | | |
|---------------------|---------------------|
| (a) 35 mm and 50 mm | (b) 20 mm and 50 mm |
| (c) 35 mm and 80 mm | (d) 20 mm and 80 mm |

36. Ans: (b)

The only option to satisfy $\frac{R}{r} = 2.5$

APGENCO ⚡ APTRANSCO

NEW BATCH ANNOUNCED AT HYDERABAD, KUKATPALLY & VIZAG

NOTIFICATION IS EXPECTED

Hyderabad : 040-23234418, 19, 20

Kukatpally : 040-6597 4465, 040-40199966, 93476 99966

Vizag : 0891-6616001, 08374808999



37. Consider the goals of the safety policy of a company, at once designating also the responsibilities and authority for their achievement:

1. Safety of employees and the public at large
2. Efforts to be made to involve all managers, supervisors and employees in the development and implementation of safety procedures
3. Clearing of all caveats that may tell on keeping the morale of the employees high

Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 2 and 3 only (c) 1 and 2 only (d) 1 and 3 only

37. **Ans: (a)**

→ Goals of safety policy of a company

→ Safety of employees and the public at large

→ Effects to be made to involve all managers, supervisors and employees in the development and implementation of safety procedures

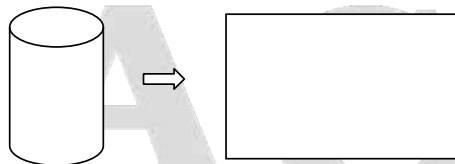
→ Clearing all caveats (hazards) that may tell on keeping the morale of the employees high.

38. Which one of the following statements is correct in the development of lateral surfaces of solids?

- (a) The development of a right cone is a triangle
- (b) Triangulation is the recommended method in the development of a prism
- (c) The development of the lateral surface of a right circular cylinder is a rectangle
- (d) The elements of an elliptical cone are equal in length

38. **Ans: (c)**

The development of the lateral surface of right circular cylinder is a rectangle.



lateral surface of a cylinder



39. A 15 kW motor drives a bar of boring machine of 30 mm diameter, twisting it through 0.01 radian, if the shear stress induced is 48 MPa and compressive stress is 57 MPa, the length of the bar whose $G = 0.80 \times 10^5$ MPa is
- (a) 400 mm (b) 350 mm (c) 300 mm (d) 250 mm

39. Ans: (d)

Power $P = 15$ kW

$d = 30$ mm

$\theta = 0.01$ radians

$\tau = 48$ MPa

$\sigma = 57$ MPa

$\zeta = 0.8 \times 10^5$ MPa

For shear stress criteria

$$\frac{\tau}{r} = \frac{\cos \theta}{\ell}$$

$$\Rightarrow \frac{48}{15} = \frac{(0.8 \times 10^5) \times (0.01)}{\ell}$$

$$\ell = 250 \text{ mm}$$

40. Consider the following statements regarding V-belt drive:

1. The groove angle of the sleeve is less than belt section angle
2. The efficiency of a V-belt drive is higher than that of a flat belt drive
3. The groove angle is so made that the belt gets wedged in the groove

Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 1 and 2 only (c) 1 and 3 only (d) 2 and 3 only

40. Ans: (c)

The efficiency of flat belt drive is higher than V-belt drive.



41. The purpose of a boring operation in relation to a drilling operation is to
- (a) Drill a hole
 - (b) Finish the drilled hole
 - (c) Correct the drilled hole
 - (d) Enlarge the drilled hole

41. Ans: (d)

Boring is used to enlarge the drilled hole.

42. Which of the following types of power have to be pre-justified; and, when the need and occasion arise, must very soon be post-justified?

1. Reward power
2. Coercive power
3. Legitimate power
4. Expert power
5. Referent power

Which of the above statements are correct?

- (a) 1, 2 and 3
- (b) 1, 2 and 5
- (c) 2, 3 and 4
- (d) 3, 4 and 5

42. Ans: (a)

There are five types of power.

1. Reward Power - The power to reward someone
2. Coercive Power – Use of force in exercise of power
3. Legitimate Power – Power vested by legitimacy
4. Expert Power - Power by virtue of knowledge
5. Referent Power- Power bestowed by virtue of love and respect

Expert and referent powers are by willful acceptance of others and therefore do not require either to be pre-justified or to be post-justified. Others are by virtue of perception of the powerful and may not be acceptable to others.



43. Factors which govern the operating cost of an equipment are:

1. Purchase price of the equipment
2. Depreciation due to regular use
3. Cost of operation, maintenance and repairs

Which of the above statements are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3

43. Ans: (c)

Operating cost + capital cost is considered in time value of money calculations.

44. Consider the following statements with reference to maintenance and service of the product after delivery to the customer:

1. Reliability analysis uses statistics of failures to estimate, understand and improve the performance of the equipment and its maintenance
2. Reliability analysis records supports or guides the maintenance engineer in improving the performance of the product under service

Which of the above statements is/are correct?

- (a) 1 only (b) 2 only (c) Both 1 and 2 (d) Neither 1 nor 2

44. Ans: (c)

Reliability statistics are applied at design stage and designing preventive maintenance programme during early failures, steady state failures and wear out failures.

45. The most fundamental attribute of TQM is

- (a) Drawing control charts (b) Having regular purposeful meetings
(c) Meeting ISO 9000 audit requirements (d) Direct involvement of top management

45. Ans: (d)



46. Internal audits are used to verify whether

1. Products conform to technical specifications
2. Quality management systems are effectively implemented

Which of the above statements are correct?

- (a) 1 only (b) 2 only (c) Both 1 and 2 (d) Neither 1 nor 2

46. Ans: (c)

47. Which industrial waste is commonly used in construction industry?

- (a) Fly ash (b) Slag (c) Sludge (d) Red oxide

47. Ans: (a)

Flyash is used for making bricks etc.

ESE / GATE / PSUs-2018

WEEKEND & MORNING BATCH

BHOPAL

Batches Starting
From

27

JAN 2017

ESE / GATE / PSUs-2018

WEEKEND BATCH

DELHI

Batches Starting
From

14

JAN 2017

GATE / PSUs-2018

WEEKEND BATCH

CHENNAI

Batches Starting
From

21

JAN 2017

GATE / PSUs-2018

EVENING BATCH

PUNE

Batches Starting
From

06

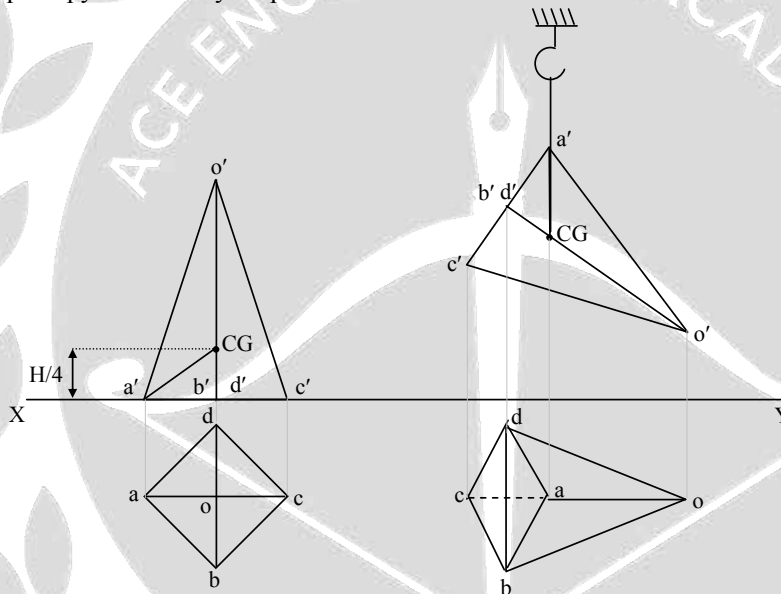
FEB 2017



48. If a square pyramid is freely suspended from one of the corners of its base, then the imaginary line joining that corner with the centre of gravity of the pyramid will be
- (a) Inclined at 60° with the vertical (b) Inclined at 45° with the vertical
(c) Inclined at 30° with the vertical (d) Vertical

48. Ans: (d)

Sol: Square pyramid freely suspended from a corner of the base.



49. The maximum percentage defects that a consumer may find definitely acceptable is called
- (a) AOQL (b) LTPD (c) AQL (d) AOQ

49. Ans: (c)

ACE



50. In which one of the following types of industrial activities does the problem of loading and scheduling become more difficult?

- (a) Single product continuous (b) Multi-product continuous
(c) Batch production (d) Continuous process production

50. Ans: (c)

Loading and scheduling are the functions to be performed based on product variety and type of production. These functions are extremely complex in job shop production and complex in batch production.

In case of mass (or) continuous production scheduling becomes simple, since, it is only one time activity.

51. Ethical issues that can affect an Engineer's professional and personal life are termed as

- (a) Macro-ethics (b) Micro-ethics (c) Morals (d) Rights

51. Ans: (b)

Micro-ethics is concerned with the decisions made by individuals and companies in their projects.

They deal with day-to-day ethical issues at personal as well as professional levels

52. The LEED and GRIHA:

1. Are green building rating systems 2. Issue energy compliance certificate
3. Refer to Global standards 4. Are Indian standards under finalization

Select the correct answer using the codes given below:

- (a) 1 and 2 (b) 2 and 3 (c) 3 and 4 (d) 1 and 4

52. Ans: (a)

LEED:- Leadership in energy and environmental design is a green building certification programme.

→ It is basically a third-party certification program.

→ It is a notionally accepted organisation for design.



Operational construction of high performance green building

→ It ensure the buildings are environmentally compatible, provide a healthy work environmental are profitable.

GRIHA:- Green rating for integrated habitat. Assessment.

→ It was founded TERI (The energy ad resource institute- newdelhi).

→ It is a council and own Rating system jointly developed by TERI and MNRE

→ It is a national rating system for green building in India.

Hence Ans: 1 and 2

53. Consider the following statements regarding activated sludge process:

1. Industries prefer activated sludge process as it requires less space, does not produce obnoxious odours and requires less time for waste water treatment compared to trickling filter
2. It requires skilled supervision
3. Biological treatment is enhanced because shock loadings are eliminated

Which of the above statements are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3

53. Ans: (d)

54. Consider the following statements regarding ozone:

1. It is continuously being produced and destroyed
2. It helps to sustain life on earth
3. It is formed in the atmosphere through photochemical reaction

Which of the above statements are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3



54. Ans: (d)

Statement (1)

Equilibrium + reverse reaction

$O_3 \xrightarrow{U.V} O_2 + O$ – destruction of O_3

$O + O_2 \rightarrow O_3$ (formation)

Which maintain O_3 conc – hence statement (1) is correct

Statement (2):- It helps in sustaining life on earth

Hence it is correct

(1) It reduces entry U.V on to surface

(2) It result in formation of vit-D

Statement (3):- correct-hence the below reaction takes place in pressure of sunlight

55. Consider the following statements regarding solar energy:

1. To encourage the adoption of solar energy production, many State Governments and the Centre have announced plans by way of buy back as well as subsidies for installation
2. Land acquisition of several hectares is a bottleneck in implementing this programme
3. Considerable R & D effort is needed to bring down the cost of P-V cells

Which of the above statements are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 1, 2 and 3 (d) 2 and 3 only

55. Ans: (c)

Statement-I:- correct

→ In India, mainly central and state govt's are providing subsidies for enhancing solar power production in India – source – GOI policy

Statement-II:- correct

→ effect → Real estate bubble

Require large extent area

Statement-III:- correct

R and D is required hence GOI as a part of international solar Alliance est NISE-national institute of solar energy in Gurgaon



56. If the efficiencies of the boiler, turbine and generator are 85%, 45% and 95% respectively, then the efficiency of the power plant is

- (a) 75% (b) 45% (c) 36.3% (d) 28.7%

56. Ans: (c)

Sol $\eta_0 = \eta_{\text{boil}} \times \eta_{\text{turbine}} \times \eta_{\text{gen}}$
 $= 0.85 \times 0.45 \times 0.95 = 0.363$

57. Which of the above statements are correct?

- (a) The end product of fossil fuels is in the form of electrical energy
(b) Watershed protection increases the rate of surface run-off of water
(c) If timber is over-harvested, the ecological functions of the forest are improved
(d) Rivers change their course during floods and lots of fertile soils are lost to the sea

57. Ans: (a)

Statement-(1):- correct

Fossil fuel → (chemical energy)

Running of machine → (Mechanical Energy)

Electrical energy

Ex:- Coal → Electrical Energy

Natural Gas → Electrical Energy

Statement (2):- Wrong

Watershed protection means- protecting a lake river or stream by effectively managing the watershed that drain into it.

Statement (3):- wrong

Timber means → Used in buildings and carpentry, fire wood

Over utilization timber → results in decrease of ecological function of the forest

Statement (4):- wrong

→ Flood generally occurs in floodplains and farm field which results in erosion of soil and results in the formation of flood plains where it accumulates in floods plains (which is high fertile soil)



58. Consider the following statements concerning environmental pollution:

1. Nuclear explosions cause radioactive radiation
2. Earthquakes do not cause Tsunamis
3. Acid rain is not a major environmental issue
4. Air pollution has some impact on meteorology

Which of the above statements are correct?

- (a) 1 and 2 (b) 2 and 3 (c) 3 and 4 (d) 1 and 4

58. Ans: (d)

Statement 1:- correct

Nuclear explosion results in release of radioactive substances (such as α , β , γ radiation) known as radiation

Pollution:- Hence nuclear explosion results in radiation pollution → which pollute environment

Statement 2:- wrong

Earth quakes donot cause Isonomic
(Wrong-But it causes Tsunamis)

Statement 3:- wrong

Acid rain is not a major environmental issue
(Wrong but it is a environmental issue)

Statement 4:-Air pollution

59. The reasons for low rate of plastic recycling are:

1. Scrap plastic has little value because virgin material is rather cheap
2. Low density of plastic leads to high shipping and handling cost
3. Recycling leads to a very severe public health hazard

Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 1 and 2 only (c) 1 and 3 only (d) 2 and 3 only



59. Ans: (b)

Statement 1:- current

Statement 2:- LDPE-carrier bags and bin liners—they are popular with consumers and retailers as they are a functional lightweight, of these go to landfills

Statement 3:- wrong

b/c the main aim of recycling of plastic is to reduce the release of environmental pollutants

60. Consider the following statements regarding internet of things (IoT):

1. IoT extends the communication via internet to all the things that surround us
2. IoT is M2M communication
3. IoT uses only wireless technology
4. The major objectives for IoT are the creation of smart environments/spaces and self-aware things

Which of the above statements are correct?

- (a) 1 and 3 (b) 2 and 3 (c) 1 and 4 (d) 2 and 4

60. Ans: (c)

The Internet of things is the internetworking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items—embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data.

IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications

61. Consider the following statements regarding SMOG:

1. SMOG was coined during the 1950's to describe a mixture of smoke and fog experienced in London
2. The principal pollutants in London SMOG are particulates and sulphur compounds
3. The London SMOG occurs generally early in the morning on cold wet winter days



Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 1 and 2 only (c) 1 and 3 only (d) 2 and 3 only

61. Ans: (a)

Smog is a mixture of smoke and fog it is a kind of air pollution.

Smog is of three types

- (1) London smog @ classical smog
(2) Los Angel smog @ photochemical smog
(3) Delhi smog

→ Principle components

London smog – SO_2 – 1952 – “The great smog of 1952”

LosAngel smog – O_3

The London smog occur generally on cold wet winter day during early morning time.

Hence Ans: (a)

62. Besides species diversity and ecosystem diversity, which of the following is included in the term ‘bio-diversity’?

- (a) Genetic diversity (b) Climatic diversity (c) Cultural diversity (d) Lingual diversity

62. Ans: (a)

Biodiversity:- means degree of variation of life. It is also known as biological diversity.

Degree of variation means it includes differed-plants animals, birds, mo’s, their geves, their habitats and all ecosystem. Hence if three level of biodiversity

- (1) Genetic biodiversity (2) Species biodiversity
(3) ecosystem biodiversity



63. Consider the following statements regarding Holostore:

1. It is a device that reads and writes data in an optical form
2. It is a computer storage device
3. It refers to Institutions where holography is taught

Which of the above statements are correct?

- (a) 1, 2 and 3 (b) 1 and 3 only (c) 1 and 2 only (d) 2 and 3 only

63. Ans: (c)

Holographic storage technology (Holostore):

Holographic data storage is a potential technology in the area of high-capacity data storage currently dominated by magnetic data storage and conventional optical data storage. Magnetic and optical data storage devices rely on individual bits being stored as distinct magnetic or optical changes on the surface of the recording medium.

64. Qualities expected of the manager of a new project are:

1. Confidence of owner entrepreneur
2. Leadership quality and authority
3. Quick decision making
4. Awareness of jobs completed so far, bottlenecks being faced and funds availability

Which of the above statements are correct?

- (a) 1, 2 and 3 only (b) 1, 3 and 4 only (c) 2, 3 and 4 only (d) 1,2,3 and only

64. Ans: (c)

65. The 'Economic life' of a building is considered to be at an end

1. When the net income from the building fails to justify its existence
2. When the building facilities become obsolete
3. When the capitalization rate becomes high

Which of the above statements are correct?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1,2 and 3



65. Ans: (a)

The “economic life” of a building is considered to be at an end.

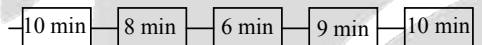
- When the net income is less than expected.
- When the facility becomes obsolete
- When the maintenance cost are very high Point 3

When the capitalization rate becomes high, it is economical to continue.

66. In a company assembly line, assembling gear boxes, five workers are assigned tasks who take 10, 8, 6, 9 and 10 minutes respectively. The balance delay for this assembly line is

- (a) 13.3% (b) 14.0% (c) 16.0% (d) 43.3%

66. Ans: (b)



Worker 1 Worker 2 Worker 3 Worker 4 Worker 5

$$\begin{aligned} \text{Cycle time} &= \text{Max } \{10, 8, 6, 9, 10\} \\ &= 10 \text{ min} \end{aligned}$$

Line efficiency (η_{line})

$$= \frac{\text{Total work content}}{\text{No. of workers} \times \text{Cycle time}}$$

$$= \frac{10 + 8 + 6 + 9 + 10}{5 \times 10}$$

$$= 0.86 \text{ (or) } 86\%$$

$$\text{Balance delay} = 100 - 86\%$$

$$= 14\%$$



67. What is an optimizing strategy?

- (a) Strategy of choosing the best possible solution considering all parameters
- (b) Strategy of choosing a compromise solution
- (c) Strategy of choosing the least cost solution
- (d) Strategy of choosing a solution on the basis of precedents

67. Ans: (a)

- Optimum strategy refer to best possible solution considering all parameters
- Optimum solution is one of the best teaisble solutions

68. With reference to problem solving, fixation refers to

- (a) Focused approach to problem solving
- (b) Planned approach to problem solving
- (c) Inability to see a problem from a fresh perspective
- (d) Inability to comprehend the goals to be achieved

68. Ans: (c)

With reference to problem solving “Fixation” refers to inability to see the problem from a fresh perspective i.e If the problem definition is just completed them there is no scope for changing the problem objects and constraints.

69. Concurrent engineering is implemented by involving a cross- functional team for design, production, testing and operational work.

- (a) During the project execution
- (b) Long before the project execution
- (c) Towards the end of the project execution
- (d) After completion of the project execution

69. Ans: (b)

Concurrent engineering is implemented by cross functional team before project implementation/execution.



70. Consider the following statements regarding project management:

1. It is the process of attaining project objectives in a stipulated time to produce quantified and qualified deliverables.
2. It is the art of bringing together the responsibilities, resources and people necessary to accomplish the business goals and objectives within the specified time limitations and within the financial grant

Which of the above statements is/are correct?

- (a) 1 only (b) 2 only (c) Both 1 and 2 (d) Neither 1 nor 2

70. Ans: (c)

- Project management is aimed at attaining project objectives in a stipulated time (correct)
- It is an integrated approach of various resources to meet the goals with in the stipulated time.

Note: Both the statements cover few keywords/attributes related to a project those are

- i. Stipulated time ii. Limited resources iii. Project deliverables

71. What is the full form of GPP?

- (a) Green Public Policy (b) Green Private Procurement
(c) Green Public Procurement (d) Green private Policy

71. Ans: (c)

Green Public Procurement (GPP) is as "a process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be procured."

By promoting and using GPP, public authorities can provide industry with real incentives for developing green technologies and products.

72. Consider the following phases of project management:

1. Identification 2. Formulation 3. Appraisal 4. Implementation

Which of the above phases are relevant, sequentially?

- (a) 1, 2 and 3 only (b) 1, 2 and 4 only (c) 3 and 4 only (d) 1,2,3 and 4



72. Ans: (d)

Phases in project management

1. Identification (Need statement)
2. Formulation (Conception/design)
3. Appraisal (Economical/Technical)

73. Phenol and formaldehyde are polymerized to a resultant product known as

- (a) PVC (b) Bakelite (c) Polyester (d) Teflon

73. Ans: (b)

Condensation of phenol and formaldehyde results in the formation of “BAKELITE”

74. Consider the following statements concerning e-governance and technology:

1. Rich Site Summary (RSS) is not a very useful tool for working on Web-service technology
2. Myspace is one of the most visited networks in the world
3. Facebook.Com is not the most useful social networking site of choice for most students
4. Wiki- is a group collaboration software tool working on Web-service technology

Which of the above statements are correct?

- (a) 1 and 4 (b) 2 and 4 (c) 1 and 3 (d) 2 and 3

74. Ans: (b)

RSS is the acronym used to describe the de facto standard for the syndication of Web content. RSS is an XML-based format and while it can be used in different ways for content distribution, its most widespread usage is in distributing news headlines on the Web.

Hence statement 1 is false

Wikis can be used when geographically dispersed team members need to collaborate. The wiki format is good for adding information and getting feedback from team members

Statement 4 is true

GATE / PSU_s-2018 MORNING BATCH HYDERABAD Batches Starting From 22 JAN 2017	GATE / PSU_s-2018 WEEKEND BATCH VIZAG Batches Starting From 28 JAN 2017
ESE / GATE / PSU_s-2018 WEEKEND BATCH TIRUPATI Batches Starting From 28 JAN 2017	ESE / GATE / PSU_s-2018 MORNING BATCH BHOPAL Batches Starting From 27 JAN 2017
ESE / GATE / PSU_s-2018 MORNING BATCH KUKATPALLY Batches Starting From 22 JAN 2017	GATE / PSU_s-2018 WEEKEND BATCH VIJAYAWADA Batches Starting From 22 JAN 2017

75. Pneumatic structures are:

1. Membrane structures
2. Stabilized by compressed air
3. Characterized by internal pressure being less than external pressure
4. Characterized by internal pressure being equal to or more than external pressure

Select the correct answer using the codes given below:

- (a) 1,2 and 3 (b) 1,2 and 4 (c) 2 and 4 only (d) 1 and 4 only



75. Ans: (b)

Pneumatic structure is a membrane structure that is stabilized by the pressure of compressed air. Air-supported structures are supported by internal air pressure. The air pressure within this bubble is increased slightly above normal atmospheric pressure and maintained by compressors or fans.

76. Consider the following statements regarding water:

1. Water is a polar molecules
2. Water molecules align themselves in an electric field
3. Water molecules vary their alignment if the applied electric polarity changes with time
4. Water molecules align themselves in a magnetic field

Which of the above statements are correct?

- (a) 1,2 and 3 only (b) 1, 2 and 4 only (c) 3 and 4 only (d) 1,2,3 and 4

76. Ans: (a)

In water molecules the atoms arranged in asymmetrically that is the positive atoms are not coincide with the negative atoms.

1. Hence it is a polar molecule.
It possess a permanent electric dipole moment.
2. When subjected to an external electric field, the molecules align in the direction of electric field.
3. On reversing the polarity the molecules also change their orientation.
4. Magnetic field has no effect on water molecule.

77. Consider the following assumptions made while developing the ionic packing theory:

1. Cations and anions are spherical but these spheres are not hard
2. Cations are always smaller than anions
3. Each cation would tend to be surrounded by the maximum number of anions permitted by geometry
4. Cations and anions do not touch each other

Which of the above assumptions are correct?

- (a) 1 and 3 (b) 1 and 4 (c) 2 and 4 (d) 2 and 3



77. Ans: (c)

Statement-2: These **cations** are **smaller than** anions because when an electron is lost, electron-electron repulsion (and therefore, shielding) decreases and the protons are better able to pull the remaining electrons towards the nucleus.

Statement-4: Due to repulsion force the cations and anions will not touch each other.

78. Consider the following statements:

1. Asphalt is a naturally occurring product having non-crystalline structure
2. Rock Asphalt occurs in limestones or sandstones
3. Tar is a residue left after distillation of crude oil
4. Resins in Asphalt provide the stickiness to the product

Which of the above statements are correct?

- (a) 1,2 and 3 only (b) 3 and 4 only (c) 1,2 and 4 only (d) 1,2,3 and 4

78. Ans: (c)

Tar is obtained by destructive distillation of coal or wood.

Statement -3 is wrong.

The option without statement -3 is 'C'.

79. Consider the following statements:

1. Baking soda is used in fire extinguishers
2. Quick lime is used in the manufacture of glass

Which of the above statements is/are correct?

- (a) 1 only (b) 2 only (c) Both 1 and 2 (d) Neither 1 nor 2

79. Ans: (c)

Baking soda is used in fire extinguishers. Quick lime is used in the manufacture of glass.



80. In the case of ionic bonding, the molecule is stable as long as the number of bonding electrons is

- (a) Equal to the number of anti-bonding electrons
- (b) Less than the number of anti-bonding electrons
- (c) Greater than the number of anti-bonding electrons
- (d) Equal to the number of anti-bonding neutrons

80. Ans: (c)

bond factor = 0.5 (Bonding electrons in the molecule – antinbonding electrons in the molecule)

when the bond factor is “zero”, the molecule is highly unstable. Hence bond factor must be greater than zero.

Based on this if bond factor is assumed as 1

1 = 0.5 (Bonding electrons in the molecule – antinbonding electrons in the molecule)

2 = Bonding electrons in the molecule – antinbonding electrons in the molecule

bonding electrons in the molecule = 2 + antinbonding electrons in the molecule

81. A resistor measures 4Ω at 40°C and 6Ω at 80°C . At 0°C the resistor will measure

- (a) 1.5Ω
- (b) 2Ω
- (c) 3Ω
- (d) 4Ω

81. Ans: (b)

The variation of resistance with temperature is given by

$R = R_0(1+\alpha t)$, where

R_0 = resistance at 0°C

R = resistance at $t^\circ\text{C}$

α = temperature coefficient of resistance

Given $R_1 = 4\Omega$, $t_1 = 40^\circ\text{C}$

$R_2 = 6\Omega$, $t_2 = 80^\circ\text{C}$

$R_1 = R_0(1+\alpha t_1)$ and $R_2 = R_0(1+\alpha t_2)$

$\therefore R_1 - R_0 = R_0\alpha t_1$ and $R_2 - R_0 = R_0\alpha t_2$

Eliminating α



$$\frac{R_1 - R_o}{R_2 - R_o} = \frac{t_1}{t_2} \Rightarrow R_o = \frac{R_1 t_2 - R_2 t_1}{(t_2 - t_1)}$$

$$R_o = \frac{4 \times 80 - 6 \times 40}{80 - 40}$$

$$\Rightarrow \frac{80}{40} = 2\Omega$$

$$\therefore R_o = 2\Omega$$

82. Fatigue resistance of materials can be improved by:

1. Shot peening
2. Polishing the surface

Which of the above is/are *correct*?

- (a) 1 only (b) 2 only (c) Both 1 and 2 (d) Neither 1 nor 2

82. Ans: (c)

83. Consider the following statements on 'firewall' used in computing systems:

1. It controls and monitors the data traffic flow between inside and outside network
2. It protects and secures the inside network from any outside network
3. It can be implemented in software or hardware or a combination of both

Which of the above statements are *correct*?

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3

83. Ans: (d)

Firewall is a network security system that monitors and controls the incoming and outgoing network traffic based on predetermined security rules. A firewall typically establishes a barrier between a trusted, secure internal network and another outside network, such as the Internet, that is assumed not to be secure or trusted.

There are various types of firewalls with differences in where they are located and what types of activity they control. Firewalls can be implemented in both hardware and software, or a combination of both.



84. Consider the following as advantages of ICT tools in educational systems:

1. Increased capacity and cost effectiveness of the educational system
2. Achievement by target groups that had limited access to traditional education
3. Support for improvement of the quality and relevance of existing structures of education
4. Provision of links between various educational institutions for knowledge sharing

Which of the above statements are *correct*?

- (a) 1, 2 and 3 only (b) 1, 2 and 4 only (c) 3 and 4 only (d) 1, 2, 3 and 4

84. Ans: (d)

ICTs in education enable

- Access to remote learning resources
- Instructions to be received simultaneously by multiple, geographically dispersed learners
- Gains in understanding and analytical skills, including improvements in reading Comprehension.
- ICT facilitates sharing of resources, expertise and advice
- Greater efficiency throughout the educational institution

85. How is the closeness or commonness of attitude, behaviour, trust and performance within the organization designated?

- (a) Cohesion (b) Morale (c) Communication (d) Leadership

85. Ans: (a)

The question deals with the behavior of an individual in an organization.

-Cohesion is defined in the textbook

-Morale is defined as the total satisfaction derived by an individual from his job, his work-group, his superior, the organization he works for and the environment.

-**Communication** is a process of exchanging verbal and non verbal messages.

-The exercise of authority, whether formal or informal, in directing and coordinating the work of others is defined as *Leadership* in Public administration



86. Accessibility legislation is intended to

- (a) Protect intellectual property
- (b) Improve the usability of websites
- (c) Make all websites easier to use for visually impaired people
- (d) Improve access to services for disabled people in both the physical and the virtual worlds

86. Ans: (d)

Government of India Act – Persons with disability (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995

Welfare Rights in Rights Ethics

87. PRAGATI is the acronym

- (a) Pro-active governance and transparency in India
- (b) Pro-active governance and timely implementation
- (c) Primary governance for transparency in India
- (d) Promoting and accomplishing governance with assured and timely implementation

87. Ans: (b)

PRAGATI (Pro-Active Governance And Timely Implementation), as the name suggests, is aimed at starting a culture of Pro-Active Governance and Timely Implementation.

It is a multi-purpose and multi-modal platform that is aimed at addressing common man's grievances, and simultaneously monitoring and reviewing important programmes and projects of the Government of India as well as projects flagged by State Governments.

88. The main goal of G2B (Government to Business) is

1. To increase productivity by giving more access to information
2. To lower the cost of doing business
3. To create more transparency

Select the correct answer using the codes given below:

- (a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3



88. Ans: (d)

G2B interaction provides a greater amount of information that business needed, also it makes those information more clear. A key factor in business success is the ability to plan for the future.

Planning and forecasting through data-driven future. The government collected a lot of economic, demographic and other trends in the data. This makes the data more accessible to companies which may increase the chance of economic prosperity.

G2B interaction reduce costs, carry out all companies to interact with the government

89. In a software project, COCOMO (Cost Constructive Model) is used to estimate

- (a) Effort and duration based on the size of the software
- (b) Size and duration based on the effort of the software
- (c) Effort and cost based on the size of the software
- (d) Size, effort and duration based on the cost of the software

89. Ans: (a)

The basic COCOMO model gives an approximate estimate of the project parameters. The basic COCOMO estimation model is given by the following expressions:

$$\text{Effort} = a_1 \times (\text{KLOC})^{a_2} \text{ PM}$$

$$\text{Tdev} = b_1 \times (\text{Effort})^{b_2} \text{ Months Where}$$

- KLOC is the estimated size of the software product expressed in Kilo Lines of Code,
- a_1 , a_2 , b_1 , b_2 are constants for each category of software products,
- Tdev is the estimated time to develop the software, expressed in months,
- Effort is the total effort required to develop the software product, expressed in person months (PMs).



90. If a clock loses 5 seconds per day, what is the alteration required in the length of pendulum in order that the clock keeps correct time?

- (a) $\frac{4}{86400}$ times its original length be shortened
- (b) $\frac{1}{86400}$ times its original length be shortened
- (c) $\frac{1}{8640}$ times its original length be shortened
- (d) $\frac{4}{8640}$ times its original length be shortened

90. Ans: (c)

Directions:

Each of the next Ten items consists of two statements, one labelled as 'Statement (I)' and the other as 'Statement (II)'. Examine these two statements carefully and select the answers to these items using the codes given below:

Codes:

- (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

91. **Statement (I):** Global warming is the cause for climate change

Statement (II): Ozone depletion will cause global warming.

91. Ans: (c)

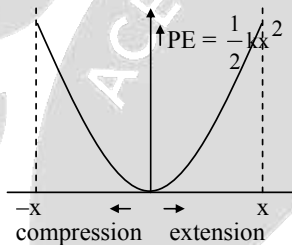


92. **Statement (I):** Graph between potential energy of spring versus the extension or compression of the spring is a straight line.

Statement (II): Potential energy of a stretched or compressed spring, is directly proportional to square of extension or compression.

92. Ans: (d)

Graph between potential energy Vs extension/compression.



Statement-1 → Not correct

$$\text{Potential Energy of a spring} = \frac{1}{2} kx^2$$

x - extension/compression of spring

Statement-2 → Correct

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93. **Statement (I):** Fatigue failure is a stress which is lower than the yield strength of a metal.

Statement (II): Repeated straining lowers the yield strength.

93. **Ans: (a)**

Fatigue failure:

When a material is subjected to a repeated and cyclic stresses and it crosses its endurance limit, the material fails at much lower stress than yield strength. This is called fatigue failure.

Fatigue failure always originates from the surface so any method to improve surface finish will increase the fatigue resistance.

So, the fatigue failure resistance is increased by

1. Short peening (introduction of local compressive stresses on material).
2. Polishing of surface.

94. **Statement (I):** Physical properties of composite materials are generally isotropic.

Statement (II): The stiffness of composite panel will often depend upon the orientation of the applied forces and /or moments.

94. **Ans: (d)**

The composites are made up of more than one material so at different locations of composites, the material properties are different. So the composites are unisotropic materials.

The stiffness of the composite materials depends upon orientation of reinforcement phase and orientation of applied forces.

So from the above information the statement (I) is wrong and the statement (II) is right.

95. **Statement (I):** Environmental considerations are not necessarily the same as, or congruent with, Ecological considerations.

Statement (II): Environmental considerations address more towards maintaining, whereas Ecological considerations address more towards sustaining.



95. Ans: (a)

Ecological Consideration

An ecosystem is a complex system with many parts, both. Living and non living. All parts of the ecosystem work together

Statement (I):- Environmental considerations are not necessarily the same as, or congruent with, Ecological considerations.

Statement (II):- Environmental considerations address more towards maintaining, whereas Ecological considerations address more towards sustaining.

96. **Statement (I):** Manganese is always added to steels since it combines with the sulphur content to form manganese sulphide.

Statement (II): If manganese is not added, iron sulphide which is not harmful for steel, would form.

96. Ans: (c)

Manganese will act as a deoxidizer and purifying agent in steel and it combines with sulphur to decrease the harmful effect on steel.

So the statement (II) is wrong.

97. **Statement (I):** Quality Circle is a method to bring Organizational Improvement through indulging the workers.

Statement (II): The main aim of Quality Circle is self-development and mutual development of grass root level employees.

97. Ans: (c)

The main aim of quality circle is to improve workplace. While doing it, workers can get trained which leads to self-development which is a by product. So, Statement 2 is incorrect. The answer is "C".



98. **Statement (I):** Digital India is a program to transform India into a digitally empowered society.

Statement (II): Digital India is a program to institute smart cities.

98. Ans: (c)

99. **Statement (I):** Increased cloud cover will lead to warmer winters due to clouds reflecting more intense solar energy.

Statement (II): Overcast cloud conditions result in decrease in the day-night temperature difference.

99. Ans: (d)

100. **Statement (I):** Engineers shall hold paramount the safety, health and welfare of the public while performing their professional duties.

Statement (II): Engineers shall continue their professional development throughout their careers.

100. Ans: (b)

Statement (I) is the fundamental Canon 1, as well as Rule of Practice 1.a in NSPE and is true

Statement (II) is a professional obligation of Engineer as per NSPE 9.e.

Both are independently true.

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3 E&T Ajay	4 E&T T.Narasimhan
5 E&T Vishal Kumar	6 E&T Rohit Kumar
7 E&T Rishi Kumar	8 E&T Vishal Kumar
9 E&T Anand Kumar	10 E&T Pranav

10 IN TOP 10 RANKS

EE

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4 EE Vishal Kumar	5 EE Anand Kumar
6 EE Pranav	8 EE Vishal Kumar
9 EE Rishi Kumar	10 EE Anand Kumar

8 IN TOP 10 RANKS

CE

2 CE Vishal Kumar	4 CE Rishi Kumar
6 CE Pranav	8 CE Anand Kumar
9 CE Vishal Kumar	10 CE Rishi Kumar

6 IN TOP 10 RANKS

ME

1 ME Vishal Kumar	2 ME Rishi Kumar
3 ME Pranav	8 ME Anand Kumar
9 ME Vishal Kumar	

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