1. Which one of the following is not a creative commons license which users can choose to apply when publishing their work?
   (a) Attribution  
   (b) Share-Alike  
   (c) Copyright Infringement  
   (d) No Derivative Works  
   Sol–1: (c)

2. The Ethernet designed by IEEE to compete with LAN protocols which can transmit data ten times faster at a rate of 100 Mbps is
   (a) fast Ethernet  
   (b) bridged Ethernet  
   (c) switched Ethernet  
   (d) full-duplex Ethernet  
   Sol–2: (a)

   Fast Ethernet standard (IEEE 802.3u) increased the transmission speed from 10 Mbps to 100 Mbps.
   It also improved the error detection and correction rates of Ethernet.
   It led to faster access to video, multimedia and the internet.
   It is used in networks with Category 5 (Cat-5) copper twisted-pair cable & fiber-optic cable.

3. IEEE standard protocol which defines a wireless Personal Area Network (PAN) operable in a room is
   (a) Wi-Fi  
   (b) Bluetooth  
   (c) Infrared  
   (d) Wireless LAN  
   Sol–3: (b)

   IEEE standard protocol which defines a wireless Personal Area Network (PAN) operable in a room is Bluetooth, which has a range of 10 meters only.
   Wi-Fi means wireless fidelity. It is a specific type of WLAN that use specifications in the 802.11 wireless protocol.
   Wi-Fi has a bigger range than a room i.e. 150 feet (46 m) indoors and 300 feet (92 m) outdoors.
   Wireless LAN is any local area network (LAN) used by a mobile user to connect through a wireless connection.
   Infra-red is not an IEEE standard protocol.

4. Which one of the following points is a private switching station that connects the national internet service provider’s network and operates at a high data rate up to 600 Mbps?
   (a) Locking point  
   (b) Peering point  
   (c) Hub point  
   (d) Modem point  
   Sol–4: (b)

   Private switching station that connects the national internet service provider’s network and operates at a high data rate up to 600 mbps is known as peering points.

5. Which one of the following is the nodal department to implement public internet access program and rural internet connectivity by converting its offices as multi-service centres?
   (a) Department of Electronics and Information Technology  
   (b) Department of Information and Broadcasting  
   (c) Department of Telecommunication  
   (d) Department of Posts  
   Sol–5: (d)

   Public Internet Access Programme has two sub components which are: Common Services Centres (CSCs) and Post Offices as multi-service centres.
   150,000 Post Offices will be converted into multi service centres.
   Department of Posts would be the nodal department to implement this scheme.

6. Which one of the following is not the vision area of Digital India as a program to transform India into a digitally empowered society and knowledge economy?
   (a) Infrastructure as utility to every citizen  
   (b) Governance and services on demand  
   (c) Free Wi-Fi access  
   (d) Digital empowerment of citizens  
   Sol–6: (c)

   Vision areas of Digital India Program are:
Take Your Preparation for ESE | GATE | PSUs to the Next Level

ADMISSIONS OPEN for SESSION 2020-21

Announcing Regular and Weekend Batches

One/Two Year(s) Classroom Program

Batches starting from

**DELHI**

Regular Batch: 15 January (Evening)
Weekend Batch: 11 January
22 January (Evening)
17 February (Morning)

**NOIDA**

Weekend Batch: 11 January

Register Now

F-126, Katwaria Sarai
New Delhi-110016
80100 09955

H-21, Sector 63
Noida-201301
0120 415 1100
Option (c) is the answer as free Wi-Fi access is not a vision area of Digital India Program.

7. Infrastructure aspects provided by the Government of India in formation of National e-Governance Plan for storage of data and hosting applications, network connectivity and capacity building respectively are
   (a) SDC, SWAN and NISG
   (b) SWAN, SDC and NISG
   (c) SDC, NISG and SWAN
   (d) SWAN, NISG and SDC

Sol–7: (a)

**State Data Centre (SDC)** is one of the important elements of the core infrastructure for supporting e-Governance initiatives of National e-Governance Plan (NeGP).

It is created for the States to consolidate services, applications and infrastructure to provide efficient electronic delivery of G2G, G2C and G2B services.

It provides functions such as: Central Repository of the State, Secure Data Storage, Online Delivery of Services, Citizen Information/Services Portal, State Intranet Portal, Disaster Recovery, Remote Management and Service Integration etc.

**State Wide Area Network (SWAN)** is one of the major infrastructure components under the National e-Governance Plan.

Its main objective is to provide secured and high speed network connectivity for Government functioning and connecting State Headquaters, District Headquaters, Blocks Headquaters.

**National Institute for Smart Government (NISG)** is a not-for-profit organization formed by the Government of India in 2002 with the aim of providing e-Governance consultancy to central and state governments to serve citizens better.

It has a 51% equity contributed by the private sector and 49% by the public sector

Its main services are:
- Consulting Services
- Capacity Building
- Project Management
- Talent Acquisition

8. Which one of the following is not the characteristic of Good Governance and e-Governance that are closely linked and depend on each other?
   (a) Accountable
   (b) Transparent
   (c) Consciousness
   (d) Consensus-oriented

Sol–8: (c)

E-Governance is a vital force for in achieving the aims of good governance such as improvement in quality, efficiency and effectiveness of governance.

Eight characteristics of Good Governance are: participatory, consensus oriented, accountable, transparent, responsive, effective and efficient, equitable and inclusive, and the rule of law.

Consciousness is not one of the above mentioned characteristics.

9. Which one of the following is not the skill needed in the workplace of the future for inventive thinking using information and communication technology in education?
   (a) Adaptability
   (b) Responsibility
   (c) Curiosity and creativity
   (d) Risk-taking

Sol–9: (b)

The skills required in the workplace of the future for inventive thinking using ICT in education include:
- Adaptability and managing complexity (enable the students to recognize and understand that change is constant, at the same time deal with change positively by modifying their thinking, attitude or behaviour to accommodate and handle new environment.)
- Self direction (students’ ability to set goals related to learning, plan for the achievement
of those goals, independently manage time and effort, and independently assess the quality of learning and any products that results from the learning experience.)

- Curiosity & creativity (Curiosity is students’ desire to learn more about something and is an essential component of lifelong learning. Creativity is the act of bringing something into existence that is genuinely new and original, whether personally or culturally.)
- Risk taking (willingness to go beyond safety zone to make mistakes, to creatively tackle challenges or problems with the ultimate goal of enhancing personal accomplishment and growth.)
- Higher order thinking and sound reasoning (cognitive processes of analysis, comparison, inference and interpretation, evaluation and synthesis applied to a range of academic domains and problem solving contexts).

10. The pedagogy which involves productive learning and finding new solutions to problems, where manipulation of existing information and creation of real-world products are possible with ICT, is called
(a) collaborative pedagogy
(b) creative pedagogy
(c) integrative pedagogy
(d) evaluative pedagogy

Sol–10: (b)

Collaborative pedagogy is an ICT-supported learning that encourages interaction and cooperation among students, teachers, and experts.

Creative pedagogy is an ICT-supported learning, which involves productive learning and finding new solutions to problems, where manipulation of existing information and creation of real-world products are possible.

Integrative pedagogy is an ICT-enhanced learning which promotes an integrative approach to teaching and learning. It provides relationship between subjects.

Evaluative pedagogy is an ICT-enhanced learning which is student-directed and diagnostic in nature.

It recognizes various different learning pathways and delivery of knowledge.

11. The basic difference between a professional and an amateur is
(a) a professional is someone who is connected with a job that needs special training or skill, while an amateur is someone who works in multi-dimensions without any specialization
(b) a professional is clear in thinking and focused on the job, while an amateur is confused and distracted from the job
(c) a professional does high quality work/job in a specific area, while an amateur is associated with specific area with lowest pay
(d) a professional remains positive and achieves despite facing grievances, while an amateur does work efficiently due to many imagined grievances

Sol–11: (a)

The basic difference between a professional and an amateur is

A professional remains positive and achieves despite facing grievances while an amateur does not work efficiently due to the many imagined grievances.

12. ‘Euthanasia’ refers to the
(a) loyalty of the people that take pride in being part of their organization and care for the organization above their own well-being
(b) ills in the society that are caused by ignorance and lack of respect for the laws of the land
(c) emotional intelligence to understand how people perform various functions
(d) killing of a terminally ill person suffering acutely with no hope of survival

Sol–12: (d)

Euthanasia refers to the killing of a terminally ill person suffering acutely with no hope of survival.

13. ‘Utilitarianism’ in the professional ethics is
(a) an acquired habit that helps to lead a rational life
(b) a skill to solve a current ethical problem by comparing it with similar problems from the past and their outcome
Conventional Question Practice Program (CQPP) for ESE-2020 Mains Exam

Classroom Program
17th Feb  Monday to Saturday
250-300 hrs  8:30 am to 2:30 pm
- Subject wise Practice, Discussion and Test
- Revised Updated & Exam Oriented Practice Booklets with Solution Outlines
- Get conceptual clarity on important topics
- Counselling Session on How to Write Answer
- Discussion and Practice Session of 250-300 hrs
- Under Guidance of Mr. Kanchan Kr. Thakur

Conventional Test Series
15th March  Every Sunday

- Classroom Solutions + Discussion
- Improve Question Selection Ability
- Cover all Concepts in Various Topics
- Improve Time Management
- Under Simulated Classroom Exam Env.
- Unique Approach : Test on New Topics + Revision Topics

Course | Branch | Fees (₹)
--- | --- | ---
Complete Package (Classroom Program + Conventional Test Series) Non IES Master Students | CE | 18000 + GST
Complete Package (Classroom Program + Conventional Test Series) Ex- IES Master Students | CE | 15000 + GST
Conventional Classroom Program (Non IES Master Students) | CE | 16000 + GST
Conventional Classroom Program (Ex- IES Master Students) | CE | 13000 + GST
Conventional Classroom Program (IES Master Classroom Program Students Session 2019-20) | CE | 11000 + GST
Conventional Offline Test Series (Non IES Master Students) | CE, ME, EE, ECE | 5000
Conventional Offline Test Series (Ex- IES Master Students) | CE, ME, EE, ECE | 5000
Conventional Offline Test Series (IES Master Classroom Program Students Session 2019-20) | CE, ME, EE, ECE | Free
Conventional Online Test Series (All Students) | CE, ME, EE, ECE | 3000

How to Apply
Students can register by making payments in person with Cash/DD at our office located at F-126, Katwaria Sarai, New Delhi - 110016 from 9 am to 8:30 pm

Enroll Now
For Query 8010009955 011 4101 3406

www.iesmaster.org
Sol–13: (d)
‘Utilitarianism’ in the professional ethics is a judgment of an action by the consequences of that action.

14. In the professional ethics, the degree of safety proposed to be attained varies with
(a) design, duration and product
(b) cost of risk, design and utility
(c) cost of risk, perception and utility
(d) product, perception and cost of risk involved
Sol–14: (b)
In the professional ethics, the degree of safety proposed to be attained varies with cost of risk, design and utility.

15. The basic ethical principle of ‘Beneficence’ states that
(a) all our thoughts and actions must be directed to ensure that others benefit from these thoughts and actions
(b) our actions must result in the least harm to the others
(c) we should not impose our views on others
(d) our actions must be fair to everyone
Sol–15: (a)
The basic ethical principle of ‘Beneficence’ states that all our thoughts and actions must be directed to ensure that others benefit from these thoughts and actions.

16. Which of the following are the main functions of WTO?
(1) To organize meetings of member countries to arrive at trade agreements covering international trade
(2) To ensure that member countries conduct trade practices as per agreements agreed upon and signed by the member countries
(3) To provide a platform to negotiate and settle disputes related to international trade between and among member countries
Sol–16: (d)
The World Trade Organization came into being in 1995.

Functions:
• Administering trade agreements (related to point 1)
• Acting as a forum for trade negotiations
• Settling trade disputes (related to point 3)
• Reviewing national trade policies
• Building the trade capacity of developing economies
• Cooperating with other international organizations
• Ensure member countries conduct trade practices as per agreements between among member countries (related to point 2)

Directions: Each of the next four (4) items consists of two statements, one labelled as ‘Statement (I)’ and the other as ‘Statement (II)’. You are to examine these two statements carefully and select the answers to these items using the code given below:

Code:
(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

17. Statement (I): If the project influence is more in decision-making for the project, then the arrangement is considered a strong matrix.

Statement (II): If functional departments are seen to be influencing the decision-making more, the arrangement is considered a weak matrix.
Sol–17: (b)

A matrix may be filled either to the project side or to the functional side depending on the circumstances. If the project influence is more in decision making for the project then the arrangement is considered a strong matrix. On the other hand, if functional departments are seen to be influencing the decision making more, the arrangement is considered a weak matrix. While a company may operate on matrix, one may see it operating with different strengths in different projects.

18. Statement (I): Raw materials are taken as traded items and their values at domestic and world prices are estimated.

Statement (II): Raw materials, which have a high value-to-volume ratio and involve proportionately high transport cost and are imported, are regarded as non-traded items.

Sol–18: (c)

In general raw materials are taken as traded items and their value at domestic and world prices are estimated. However, raw materials which have a low value to volume ratio and involve disproportionately high transport cost and which are not imported are regarded as non-traded items.

19. Statement (I): Information and Communication Technologies (ICTs) can facilitate improved service delivery and more efficient internal operations.

Statement (II): ICTs can create new opportunities for the marginalized and the vulnerable of society but do not represent a panacea for all development problems.

Sol–19: (b)

Statement (I) is correct. ICTs do facilitate improved service delivery to customers in organization and citizens of the country and better efficient internal operations.

It also provides deep insights into the performance of the business organization and compares comparison with the other business organizations of the industry.

ICT is not only cost-effective due to its reach, but it also allows for innovative implementation measures to be put in place in an organization.

Statement (II) is correct. It can improve the quality of human life because it can be used as learning and education media, the mass communication media in promoting and campaigning practical and important issues, such as the health and social area.

For e.g.: Access to & use of ICTs assists adolescent girl’s access to information about their own sexual and reproductive health or to online trainings, skills development & opportunities in the labour market.

ICT applications do not offer a panacea for social and economic development problems as there are risks of unemployment and social and economic dislocation.

But Statement (I) and Statement (II) are not related to each other as Statement (II) is not the correct explanation of Statement (I).

20. Statement (I): Long-term sustainability of e-Governance projects does not depend on financial viability, especially if they are to be implemented in the Public-Private Partnership (PPP) mode.

Statement (II): Front-end e-services are possible without back-end computerization.

Sol–20: (d)

Statement (I) is not correct. Long-term sustainability of e-Governance projects depend on financial viability, especially if they are to be implemented in the Public-Private Partnership (PPP) mode.

Financial Viability is the process which evaluates the risk involved over the life of a proposed project, to effectively deliver the goods and services which are specified in the project.

Statement (II) is correct. Front end e-services are possible without back-end computerization.

For e.g.: FRIENDS (Fast Reliable Instant Efficient Network for Disbursement of Services) project by the Government of Kerala is a Single Window Facility which helps the citizens to pay taxes and other financial dues to the State Government. It provides evidence that the state attempted front-end computerisation efforts in the first phase itself, when the backend computerization of individual departments was still in development stage (not implemented).
UPPSC
Assistant Engineer Examination-2019

22 Departments...

692 Posts

Batches Starts
11
February

Click here for more information

F-126, Katwaria Sarai, New Delhi-110016 | Call +91 801 00 09955
Email: info@iesmaster.org

H-21, Sector 63, Noida - 201305 | Call 0120 415 1100
Email: info.noida@iesmaster.org | Website: iesmaster.org
21. Find the absolute maximum and minimum values of
\[ f(x, y) = 2 + 2x + 2y - x^2 - y^2 \]
on triangular plate in the first quadrant, bounded by the lines \( x = 0, y = 0 \) and \( y = 9 - x \).
(a) -4 (b) -2 (c) 4 (d) 2

Sol–21: (c)

\[ f_x = 2x - 2 \]
\[ f_y = 2y - 2 \]
\[ f_{xx} = 0 \quad f_{yy} = 0 \quad f_{xy} = 0 \]
\[ (0, 0) \quad (9, 0) \quad (0, 9) \quad (1, 1) \]

So stationary point (1, 1) which is lying inside triangular plate. There are 4 critical points (0, 0), (9, 0), (0, 9) and (1, 1) (Corner and stationary point).

<table>
<thead>
<tr>
<th>(x,y)</th>
<th>f(x,y)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0,0)</td>
<td>2</td>
</tr>
<tr>
<td>(9,0)</td>
<td>-61</td>
</tr>
<tr>
<td>(0,9)</td>
<td>-61</td>
</tr>
<tr>
<td>(1,1)</td>
<td>4</td>
</tr>
</tbody>
</table>

From above table absolute maxima = 4 and absolute minima = -61.

22. For the matrix
\[ A = \begin{bmatrix} 1 & 4 \\ 2 & 3 \end{bmatrix} \]
the expression
\[ A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I \]
is equivalent to
(a) \( A^2 + A + 5I \) (b) \( A + 5I \) (c) \( A^2 + 5I \) (d) \( A^2 + 2A + 6I \)

Sol–22: (b)

Characteristic equation of given matrix
\[ (1-\lambda)(3-\lambda) - 8 = 0 \]
\[ \lambda^2 - 4\lambda - 5 = 0 \]

Using Cayley Hammilton Theorem
\[ A^2 - 4A - 5I = 0 \]
\[ A^3 = 21A + 20I \]
\[ A^4 = 104A + 105I \]
\[ A^5 = 521A + 520I \]

Now value of \( A^5 - 4A^4 - 7A^3 + 11A^2 - A - 10I \)
\[ = 521A + 520I - 4(104A + 105I) - 7(21A + 20I) \]
\[ + 11(4A + 5I) - A - 10I \]
\[ = A + 5I \]

23. The solution of the differential equation
\[ (1 + y^2)dx = (\tan^{-1}y - x)dy \]
is
(a) \( x = \tan^{-1}y + 1 + ce^{-\tan^{-1}y} \)
(b) \( x = \tan^{-1}y - 1 + ce^{-\tan^{-1}y} \)
(c) \( x = \frac{1}{2} \tan^{-1}y - 1 + ce^{-\tan^{-1}y} \)
(d) \( x = \frac{1}{2} \tan^{-1}y + 1 + ce^{-\tan^{-1}y} \)

Sol–23: (b)

\[ \frac{1 + y^2}{\tan^{-1}y - x} \]
\[ \frac{dx}{dy} = \frac{\tan^{-1}y}{1 + y^2} - \frac{x}{1 + y^2} \]
\[ \frac{dx}{dy} + \frac{x}{1 + y^2} = \frac{\tan^{-1}y}{1 + y^2} \quad ...(1) \]

Given D.E. is linear differential equation where
\[ P = \frac{1}{1 + y^2} \]
\[ Q = \frac{\tan^{-1}y}{1 + y^2} \]

I.F. \[ e^{\int Pdy} = e^{\frac{dy}{1 + y^2}} = e^{\tan^{-1}(y)} \]

Solution of D.E. (i)
Detailed Solution

24. The value of

\[ \Delta^{10} \left( (1 - ax)(1 - bx^2)(1 - cx^3)(1 - dx^4) \right) \]

is

(a) abcd (10)!  
(b) abcd (9)!  
(c) abcd (8)!  
(d) abcd (7)!

Sol–24: (a)

\((1 - ax)(1 - bx^2)(1 - cx^3)(1 - dx^4)\) is polynomial of degree 10. We know that \(n^{th}\) forward difference of a polynomial of degree \(n\) is always constant. So

\[
\Delta^{10} (1 - ax)(1 - bx^2)(1 - cx^3)(1 - dx^4) = \Delta^{10} (1 - ax + \ldots + abcd x^{10}) = abcd (10!)
\]

25. If \(u = \log_e \left( \frac{x^4 + y^4}{x + y} \right)\), the value of \(x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}\) is

(a) 6  
(b) 5  
(c) 4  
(d) 3

Sol–25: (d)

\(u = \log_e \left( \frac{x^4 + y^4}{x + y} \right)\)

is not a homogeneous function but \(e^u = \frac{x^4 + y^4}{x + y}\)

is a homogenous function of degree 3 so using Euler's Indirect theorem.
28. X is a continuous random variable with probability density function given by

\[ f(x) = \begin{cases} 
  kx & (0 \leq x < 2) \\
  2k & (2 \leq x < 4) \\
  -kx + 6k & (4 \leq x < 6) 
\end{cases} \]

The value of k will be

(a) \( \frac{2}{3} \)  (b) \( \frac{1}{8} \)
(c) 1  (d) 8

Sol–28: (b)

If \( f(x) \) is a density function. Then,

\[
\int_{0}^{2} f(x) dx + \int_{2}^{4} f(x) dx + \int_{4}^{6} f(x) dx = 1
\]

\[
2k + 4k + 2k = 1
\]

\[ 8k = 1 \]

\[ k = \frac{1}{8} \]

29. The first moment about origin of binomial distribution is

(a) np  (b) npq  
(c) \( n(1-p) \)  (d) \( n(1-p)q \)

Sol–29: (a)

First moment is referred as expected value. Expected value of BD = np

30. For the regression equations:

\[ y = 0.516x + 33.73 \text{ and } x = 0.512y + 32.52 \]

the means of \( x \) and \( y \) are nearly

(a) 67.6 and 68.6  (b) 68.6 and 68.6  
(c) 67.6 and 58.6  (d) 68.6 and 58.6

Sol–30: (a)

\[ y = 0.516x + 33.73 \]

\[ y - 0.516x = 33.73 \]  ...(1)

\[ -0.516x + y = 33.73 \]

and

\[ x = 0.512y + 32.52 \]

\[ x - 0.512y = 32.52 \]  ...(2)

On solving eqn. (1) and (2), we get mean of \( x \) and \( y \).

\[ x = 67.6 \]

and

\[ y = 68.6 \]

31. In a rectangular hyperbola, if a curve is traced out by a point moving in such a way that the product of its distances from two fixed lines at right angles to each other is a constant, then those fixed lines are called

(a) asymptotes  (b) intercepts  
(c) holes  (d) limits

Sol–31: (a)

For a rectangular hyperbola,

\[ xy = \text{Constant}, \quad x, y = \text{Assymptotes} \]

32. The line passing through the focus and perpendicular to the directrix is called

(a) axis  (b) vertex  
(c) eccentricity  (d) conic

Sol–32: (a)

A line passing through focus and perpendicular to directrix is an axis of that conic.
MASTER GATE CBT 2020
Computer-based All India Mock Test for GATE 2020 Aspirants

at 30 centres

Write GATE before the real GATE 2020
Improve your speed & accuracy
Get ranking among best engineering minds
Get the confidence to work on your GATE Score

EXAM PATTERN
Questions: 65
Language: English
Marks: 100
Duration: 3 Hours

FEE STRUCTURE
Master GATE CBT-1: ₹ 400
Master GATE CBT-2: ₹ 400
Master GATE CBT-1+ CBT-2: ₹ 700

Exam Dates
CBT 1
18 Jan
CBT 2
25 Jan

IMPORTANT DATES
CBT-1
Registration Closes 12th Jan 2020
Exam Date 18th Jan 2020
Result Date 24th Jan 2020
CBT-2
Registration Closes 19th Jan 2020
Exam Date 25th Jan 2020
Result Date 31st Jan 2020

How To Register
- Scan the QR Code given on left to access the Master GATE Registration Web page.
- On the Registration Form, fill in the required details. Choose your Exam Centre carefully.
- Once detailed are filled, submit the form.
- You will receive the User ID and Password on your given mobile number, and will be directed to the Payment Gateway page.
- Make the required payment for registration
- After the payment process, response page will open where you can check your payment details.
- If the payment failed anyway, you can pay the same by login into the student zone with the user credentials sent to your registered mobile number.

Test Centres
Agra, Ahmedabad, Allahabad, Bengaluru, Bhilai, Bhopal, Bhubaneswar, Chandigarh, Chennai, Dehradun, Delhi, Guwahati, Gwalior, Hyderabad, Hamirpur, Jamshedpur, Jaipur, Jammu, Kanpur, Kolkata, Lucknow, Mumbai, Noida, Patna, Pune, Raipur, Ranchi, Roorkee, Varanasi, Warangal

Email: mastergate@iesmaster.org | Visit: iesmaster.org/master-gate/

Delhi Centre
F-126, Katwarla Sarai, New Delhi - 110016
Call at +91 80100 09955

Noida Centre
H-21, H Block, Sector 63, Noida - 201301
Call at 0120 415 1100
33. Dimensions in a series may be placed in any one of the following ways, except
(a) progressive dimensioning
(b) proportional dimensioning
(c) continuous dimensioning
(d) chain dimensioning
Sol–33: (b)
Progressive dimensioning is also known as parallel dimensioning in which dimensioning is done from a datum line. Where as in chain (or) continuous dimensioning (or) in proportional dimensioning, dimensions are placed in series.

34. Among the effects of design specifications on costs, which one of the following is the most significant that influences the producibility of end product?
(a) Standard size  (b) Large tolerance
(c) Breakeven point   (d) Cost estimate
Sol–34: (b)
Among the effects of design specifications on costs, those of tolerance perhaps most significant. Tolerance in design influence the producibility of the end product in many ways from necessitating additional step in processing to rendering apart completely impractical to produce economically.
- Permissible tolerance must be placed on dimension of a part to limit the acceptable variations in the size of a part AOS.
- A small tolerance means greater ease of interchangeability of parts but this obviously leads to increase cost in manufacturing.

35. Which one of the following is not the best approach for the prevention of product liability?
(a) Analysis and design
(b) Quality control
(c) Comprehensive testing
(d) Cost
Sol–35: (d)
Best approach for prevention of the product liability are :
(a) Analysis and design
(b) Quality control
(c) Comprehensive testing

36. Which one of the following is not the way of estimating the statistical parameters and is integral part of analysis or synthesis tasks when probability of failure is involved?
(a) Propagation of error
(b) Propagation of uncertainty
(c) Propagation of weight
(d) Propagation of dispersion
Sol–36: (c)
There are ways of estimating the statistical parameters describing weight and inertia from those describing size and density. These methods are variously called propagation of error, propagation of uncertainty or propagation of dispersion. These methods are integral parts of analysis or synthesis task when probability of failure is involved.

37. In order to limit the seriousness of an accident, emergency controls should be provided with which of the following as determining factors in the location of emergency stops?
(a) Speed and ease of operation
(b) Common sense of workers
(c) Nearest exits and checkpoints
(d) Supervisors and decision-makers
Ans. (d)
Sol. ?

38. Human engineering approach is followed to prevent accidents by giving due consideration to physical and mental limitations of the workers by
(a) giving constant attention to how a worker is likely to react rather than how supervisor would like him to react
(b) imposing too many safety rules
(c) not permitting to make safety device or guard inoperative
(d) giving first-aid attention in case of injury
Sol–38: (a)
Human engineering approach or work ergonomics improvements are changes made to improve the fit between a job and capabilities of the employees performing it. They are commonly
(i) Engineering improvements
(ii) Administrative improvements
(iii) Safety fear

39. Which one of the following is not an operator error through triggers leading to an accident which confuses and traps into making mistake?
(a) Faulty design or construction of machine tool
(b) Poor housekeeping and cleanliness
(c) Standard operating safety practice
(d) Lack of standardization and identification

Sol–39: (a)
Faulty design or construction of machine tool is not an operator error but it is a design error.

40. Which one of the following is not included in the safety program for achieving good results during the prevention of accidents?
(a) Development of safe working conditions
(b) Promotion of employees participation in safety
(c) Compensation and medical payment
(d) Corrective action when safety rules are ignored

Sol–40: (c)
The compensation and medical payments are not part of safety program. It is responsibility of non-safety managers.

41. During an assessment of economic viability of project, the ratio of average annual earnings after tax to the average book investment after depreciation is called
(a) Benefit-Cost Ratio (BCR)
(b) Net Present Value (NPV)
(c) Pay-Back Period (PBP)
(d) Return on Investment (ROI)

Sol–41: (d)
Average rate of return is also called as return on investment

ROI = \( \frac{\text{Annual average profit after tax}}{\text{Average investment}} \times 100 \)

42. Who is responsible for the following activities in a project?
1. Achieving a unity of control over project activities
2. Having an authority to control project matters and disburse funds from the budget
3. Having no actual line of authority over workers
   (a) Project Expeditor
   (b) Project Coordinator
   (c) Matrix Manager
   (d) Project Manager

Sol–42: (b)
Davis’s classification can be used to introduce four types of project managers:

• **Project expeditors**, whose purpose is to try to speed up work. They are the communication link between senior managers and the project. Their purpose is to achieve unit of communications. They are not really managers, but are go-betweens who translate technical concepts into business concepts such as costs, schedules, and markets. The role is limited to funneling information from technical workers to executives, and making suggestions; thus, it tends to be restricted to small projects with low risk and little at stake.

• **Project coordinators**, whose purpose is to achieve unity of control over project activities. They have authority to control project matters and disburse funds from the budget, but no actual line authority over workers. Their authority derives solely from their association with upper-level managers. The construction project manager, for example, would be in this position if the coordinated the work but needed approval from the developer for major decisions such as contracting or allocation of funds.

• **Matrix managers**, whose purpose is to achieve unity of direction. Although they serve the same purposes as the first two, they additionally have authority to plan, direct, and control project work. Matrix managers direct
MASTER TALENT REWARD EXAM
A National Level Online Scholarship Test
For ESE 2021 & GATE 2021 Aspirants

CE  ME  EE  ECE

Get up to 100% Scholarship

MTRE-02 is a national level scholarship exam conducted online by IES Master. It offers a window of opportunity to students to be at par, and be one among the best engineering minds.

EXAM PATTERN

<table>
<thead>
<tr>
<th>Mode</th>
<th>Online</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time Duration</td>
<td>1 Hour</td>
</tr>
<tr>
<td>Total Marks</td>
<td>100</td>
</tr>
<tr>
<td>Total Question</td>
<td>50</td>
</tr>
<tr>
<td>Negative Marking</td>
<td>0.50 marks</td>
</tr>
</tbody>
</table>

Test can be written from anywhere using system (Desktop, Laptop) and web camera. Each Questions will be provided 4 alternative options.

SYLLABUS

<table>
<thead>
<tr>
<th>Subject</th>
<th>Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Engineering</td>
<td>25 MCQs</td>
</tr>
<tr>
<td>Engineering Mathematics</td>
<td>10 MCQs</td>
</tr>
<tr>
<td>Reasoning &amp; Aptitude</td>
<td>10 MCQs</td>
</tr>
<tr>
<td>General English</td>
<td>05 MCQs</td>
</tr>
</tbody>
</table>

IMPORTANT DATES

| Registration Start Date       | 04-Nov-19 |
| Registration End Date         | 05-Mar-20 |
| MTRE-02 Exam Date             | 08-Mar-20 |
| Result Date                   | 13-Mar-20 |

REGISTRATION FEE

MTRE-02 (Session 2020-21)  ₹ 50

HOW TO REGISTER

- Visit MTRE website: iesmaster.org/master-talent-reward-exam.
- Click on ‘Register’ button. Registration page opens, fill all the details on the MTRE-02 online registration form.
- After submitting you will get the User ID and Password and will be directed to payment gateway page.
- Make the payment of Rs 50/- as the registration fee.
- After the payment process, response page will open where you can check your payment details.
- If the payment failed anyway, you can pay the same by logging into your student zone with the login credentials sent to your registered mobile number.

Visit iesmaster.org/master-talent-reward-exam or Call on +91 80100 09955 | +91 97118 53908

Register Now
people located administratively in different functional departments, and the resulting crisscross pattern of vertical-functional and horizontal-project reporting relationships create what is called a matrix organization. For example, the manager of Project Over oversees project tasks 1-3, which are performed by people assigned from the functional areas of accounting, contracts, etc. Another example is the manager of a construction project that involves both designing and constructing a building. Managers from the architectural and construction departments assign personnel to the project, who then report to the project manager for as long as needed. The same personnel may also work on other projects and report to other matrix managers.

- Pure project managers, whose purpose is to achieve unity of command over the people in pure project organizations that report directly to them. They are primarily integrators and generalists rather than technical specialists. They must balance technical factors of the project with schedules, costs, resources, and human factors. In the course of project, they deal with top management, functional managers, vendors, customers, and subcontractors. The manager of a large construction project who is hired by the developer and delegated the authority to make major decisions (such as selecting and contracting with the architect and the contractor has such a role).

43. The creative technique applied when the available and required inputs as well as the desired outputs are listed, is
(a) attribute listing  (b) direct dreaming  (c) black box  (d) Delphi
Sol–43: (c)

Black box testing is also known as behavioral, opaque box, closed box, specification-based or eye-to-eye testing.

It is a software testing method that analyses the functionality of a software/application without knowing much about the internal structure/design of the item that is being tested and compares the input value with the output value.

44. The market price per share of a company is Rs 125. The dividend per share (DPS) expected a year is Rs 12 and DPS is expected to grow at a constant rate of 8% per annum. The cost of the equity capital to the company will be
(a) 17.6%  (b) 15.4%  (c) 13.2%  (d) 11.8%
Sol–44: (a)

Cost of equity capital = \( \frac{DPS}{MP} + G \)
= \( \frac{12}{125} \) % + 8%
= 9.6% + 8%
= 17.6%

where, DPS = Dividend per share
MP = Market price
G = Growth rate

45. Which one of the following risks can be reduced by investing in projects or acquiring other firms that have a negative correlation with the earnings of the firm?
(a) Investment risk  (b) Business risk  (c) Financial risk  (d) Portfolio risk
Sol–45: (d)

Negative correlation of investments are used with portfolio risk management to decide how to allocate assets. Investors and portfolio manager believe that some of the risk associated with the portfolio would be diversified if they can be assemble a portfolio of negative correlated assets.

46. An individual investor who invests in the e-project usually during an early stage is
(a) Corporate strategic investor  (b) Founder capital
(c) Angel investor  
(d) Venture capital  

Sol–46: (c)  
An angel investor is usually a high net worth individual who funds startups at the early stages often with their own money. Angel investing is often the primary source of funding for many startups who find it more appealing than other, more predatory, forms of funding.  

47. If the nominal rate of interest is 12% and is compounded quarterly, the effective rate of interest per annum will be nearly  
(a) 10.8%  
(b) 12.6%  
(c) 14.4%  
(d) 16.2%  

Sol–47: (b)  
Effective annual interest rate = \[
\left(1 + \frac{i}{c}\right)^c - 1
\]
where, \(i\) = Nominal interest rate per year  
\(c\) = Number of times compounding in a year  
\(i_{eff} = \left(1 + \frac{12\%}{4}\right)^4 - 1\)  
\(i_{eff} = 12.55\% \approx 12.6\%\)  

48. In a bank, deposits can be made for periods ranging from 6 months to 10 years. Every quarter, an interest will be added on to the principal. The rate of interest applied is 9% per annum for periods from 12 months to 23 months and 10% per annum for periods from 24 months to 120 months. An amount of Rs 1,000 invested for 2 years to grow, will be nearly  
(a) Rs 1,218  
(b) Rs 1,334  
(c) Rs 1,414  
(d) Rs 1,538  

Sol–48: (a)  
Effective annual interest rate = \[
\left(1 + \frac{i}{c}\right)^c - 1
\]
where, \(i\) = Nominal interest rate per year  
\(c\) = Number of times compounding in a year  
\(i_{eff} = \left(1 + \frac{0.10}{4}\right)^4 - 1\)  
\(i_{eff} = 10.38\%\)  
Future amount after 2 years = \(1000(1.1038)^2\)  
= 1218.37 \(\approx 1218\)  

49. A company has issued Rs 20 million worth of non-convertible debentures, each at a face value of Rs 100 at the rate of 12%. Each debenture is redeemable at a premium of 5%, after 10 years. If the net amount realized is Rs 95 and tax rate is 40%, the cost per debenture will be  
(a) 5.8%  
(b) 6.6%  
(c) 7.4%  
(d) 8.2%  

Sol–49: (d)  
Cost per debenture = \[
\frac{\text{Interest} \times (1-\text{tax}) + \left(\frac{\text{RV} - \text{NP}}{\text{n}}\right) \times 100}{\left(\frac{\text{RV} + \text{NP}}{2}\right)}
\]
where \(\text{RV}\) = Redeemable value  
\(\text{NP}\) = Net proceeds from issue  
\(\text{Tax}\) = 40%.  
\(\text{Interest} = 12\%\), \(\text{Tax} = 40%\).  
\(\text{Cost of Debt} = \frac{12 \times (1 - 0.4) + \frac{(105 - 95)}{10} \times 100}{\left(\frac{105 + 95}{2}\right)}\)  
= \(\frac{(7.2 + 1) \times 100}{100}\) = 8.2\%  

50. A cybernetic control system that acts to reduce deviations from standard is called  
(a) a negative feedback loop  
(b) a positive feedback loop  
(c) a closed loop  
(d) an open loop  

Sol–50: (a)  
A cybernetic control system that acts to reduce deviations from standard is called a negative feedback loop. If the system output moves away from the standard in one direction, the control mechanism acts to move it in the opposite direction. The speed or force with which the control operates is, in general, proportional to the size of the deviation from the standard. The precise way in which the deviation is corrected depends on the nature of the operating system and the design of the controller.  

51. In which one of the following types of bonds, the bond formation is by free moving electrons in an array of positive ions?
Coal India Limited Online Test Series
Management Trainee

- Test papers as per CIL MT exam pattern and syllabus
- Develop speed, accuracy, and time management skills
- Comprehensive analysis and feedback after each test
- Get into the real CIL-MT CBT exam mode

16 Tests
Fee ₹1,000/-

<table>
<thead>
<tr>
<th>Mixed Subjects Tests</th>
<th>Full Length Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper-I (General Ability) - 5</td>
<td>Paper-I (General Ability) - 3</td>
</tr>
<tr>
<td>Paper-II (Engineering Discipline) - 5</td>
<td>Paper-II (Engineering Discipline) - 3</td>
</tr>
</tbody>
</table>

TEST SERIES SCHEDULE

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Test Name</th>
<th>Paper</th>
<th>Exam Date</th>
<th>Questions</th>
<th>Marks</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test-01</td>
<td>Mixed Subjects Test-01</td>
<td>Paper-I</td>
<td>11-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-02</td>
<td>Mixed Subjects Test-02</td>
<td>Paper-II</td>
<td>11-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-03</td>
<td>Mixed Subjects Test-03</td>
<td>Paper-I</td>
<td>12-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-04</td>
<td>Mixed Subjects Test-04</td>
<td>Paper-II</td>
<td>12-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-05</td>
<td>Mixed Subjects Test-05</td>
<td>Paper-I</td>
<td>19-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-06</td>
<td>Mixed Subjects Test-06</td>
<td>Paper-II</td>
<td>19-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-07</td>
<td>Mixed Subjects Test-07</td>
<td>Paper-I</td>
<td>26-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-08</td>
<td>Mixed Subjects Test-08</td>
<td>Paper-II</td>
<td>26-Jan</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-09</td>
<td>Mixed Subjects Test-09</td>
<td>Paper-I</td>
<td>02-Feb</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-10</td>
<td>Mixed Subjects Test-10</td>
<td>Paper-II</td>
<td>02-Feb</td>
<td>50</td>
<td>50</td>
<td>45 Minutes</td>
</tr>
<tr>
<td>Test-11</td>
<td>Full Length Test-01</td>
<td>Paper-I</td>
<td>09-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>Test-12</td>
<td>Full Length Test-02</td>
<td>Paper-II</td>
<td>09-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>Test-13</td>
<td>Full Length Test-03</td>
<td>Paper-I</td>
<td>16-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>Test-14</td>
<td>Full Length Test-04</td>
<td>Paper-II</td>
<td>16-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>Test-15</td>
<td>Full Length Test-05</td>
<td>Paper-I</td>
<td>23-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
<tr>
<td>Test-16</td>
<td>Full Length Test-06</td>
<td>Paper-II</td>
<td>23-Feb</td>
<td>100</td>
<td>100</td>
<td>90 Minutes</td>
</tr>
</tbody>
</table>

Delhi Centre
F-126, Katwaria Sarai, New Delhi - 110016
Call at +91 80100 09955

Noida Centre
H-21, H Block, Sector 63, Noida - 201301
Call at 0120 415 1100
(a) Homopolar bond
(b) Electrostatic bond
(c) Metallic bond
(d) Covalent bond

Sol–51: (c)
In metallic bond free electron act as glue to hold the ion (+ve) core together. In it lattice of positive ion embedded in a sea of electrons.

52. If a pair of one cation and one anion is missing in an ionic crystal such that those pairs of ions are equal to maintain electrical neutrality, then that pair of vacant sites is called
(a) Schottky imperfection
(b) Pair of vacancies
(c) Frenkel defect
(d) Point imperfection

Sol–52: (a)
This is a kind of stoichiometric defect (i.e. electrical neutrality) and found in AX materials e.g. Halide.
In which anion and cation missing in pair and forms vacancy.

53. Which of the following are the characteristics of covalent compounds?
1. They are mostly gases and liquids
2. They are usually electric insulators.
3. They are directional in nature.
4. They are insoluble in polar solvents like water but are soluble in non-polar solvents.
(a) 1, 2 and 3 only
(b) 1, 2 and 4 only
(c) 1, 3 and 4 only
(d) 1, 2, 3 and 4

Sol–53: (d)
Covalent compounds are directional in nature due to covalent bond.
It exist in solid, liquids and gas.
Covalent solids or compound do not dissolve in polar, solvents.
These dissolves in non-polar solvents.
They are usually bad conductors of electricity exception is graphite.
But as 2, 3, 4 are perfectly correct only doubt is with option 1. But for this option 1 may be considered as correct.

54. The photoelectric current depends on which of the following factors?
1. The frequency of the incident light
2. The intensity of the incident light
3. The potential difference between the electrodes
4. The photosensitivity of the non-metal
(a) 1, 2 and 4
(b) 1, 2 and 3
(c) 1, 3 and 4
(d) 2, 3 and 4

Sol–54: (b)
For a given metal photoelectric current depends on:
(i) The potential difference between two plates
(ii) The intensity of incident radiation
(iii) The frequency of incident radiation
(iv) The photometal used

55. Which one of the following statements is correct regarding ductile fracture?
(a) Fractured surfaces are crystalline in appearance.
(b) There is virtually no reduction in cross-sectional area during fracture.
(c) Fracture takes place after necking with little sound.
(d) Percentage elongation is about 60% prior to fracture occurs.

Sol–55: (c)
Ductile fracture occurs after prolonged plastic deformation and is accompanied by necking. It requires higher strain energy.
Due to necking warning sign can be easily sensed.

56. Which of the following factors are affecting critical shear stresses?
1. Purity of metals reduces the critical shear stress
2. Surface films greatly enhance the critical shear stress
3. Rise in temperature
4. Rate of deformation and the extent of initial
deformation also help in raising the critical shear stress
(a) 1, 2 and 3 only (b) 1, 2 and 4 only
(c) 1, 3 and 4 only (d) 1, 2, 3 and 4

Sol–56: (d)

Critical shear stress : The shear stress needed to cause slip in given direction along a given crystallographic plane of single crystal.

Factors influencing the critical shear stress :
(i) Purity in metals reduces the critical stress
(ii) Surface effects like surface films greatly increase the critical shear stress.
(iii) Temperature increase the thermal mobility and hence decrease the critical shear stress.
(iv) Rate of deformation and the extent of initial deformation will also rise the critical shear stress.
(v) In dislocation i.e. shear stress, dislocation move only in that plane and direction which have highest planar density and linear density (e.g. polycrystalline material). This defined slip system.

57. Which one of the following types of materials is having high remanence, coercivity and saturation flux density as well as low permeability and high hysteresis energy losses?
(a) Soft magnetic materials
(b) Hard magnetic materials
(c) Hard electrical materials
(d) Soft electrical materials

Sol–57: (b)

Hard magnetic materials have
(i) High coercive force or coercivity
(ii) Low permeability
(iii) Appreciable remanence
(iv) High hysteresis losses
(v) Considerable saturation flux density

58. Polymers having strong primary bonds throughout, often formed by condensation polymerization, and their structure resembles one large molecule, are known as
(a) thermoplastic polymers
(b) thermosoftening polymers
(c) thermosetting polymers
(d) random polymers

Sol–58: (c)

• Thermosetting polymers are formed by condensation polymerization.
• These are characterised by strong cross linked covalent bond (primary bond) and give three dimensional molecular structure and have very high molecular weight.
• 2nd bond (van der Waals bond) found in thermoplastic material.

59. An FET is a semiconductor device with the output current controlled by an electric field and its current is carried predominantly by one type of carriers. It is known as
(a) junction transistor
(b) unipolar transistor
(c) MOSFET
(d) IGBT

Sol–59: (c)

• There are two types of field effect transistors (FET) junction FET and metal oxide FET (MOSFET).
• FETs are unipolar devices means the charge carriers are of only one type either electrons or holes.

60. Which one of the following is the trade name of polycarbonates?
(a) Alathon
(b) Baylon
(c) Bexphane
(d) Cycloac

Sol–60: (*)

• Alathon – trade name HDPE
• Baylon – trade name of PAb, PAbb (polyamide nylon)
• Bexphane – trade name of polypropylene
• Cycolae – trade name of ABS
• Trade name of polycarbonate is lexon and marton.

61. Which of the following departments ensure the quality of the product?
1. Product design and development
GATE 2020 Online Test Series

- Matches level & orientation of GATE
- Thoroughly researched test papers
- Improve speed, accuracy & time management
- Track & monitor your performance

70 Tests

40 Topic-wise Tests

14 Subject-wise Tests

10 Mixed Subjects Tests

6 Mock Tests (Full Length)

Registrations Open, Enrol Now

To register, visit iesmaster.org or contact
IES MASTER help desk at 80100 09955, 97118 53908
2. Marketing and product planning
3. Packaging and shipping
4. Sales
   (a) 1, 2 and 3  (b) 1, 2 and 4
   (c) 1, 3 and 4  (d) 2, 3 and 4

Sol–61: (a)
The department responsible for quality are marketing, design engineering, procurement, process design, production, inspection and testing, packaging and shipping and product service.

62. Which of the following are the general subareas of quality control?
   1. Off-line quality control
   2. Sales/market share
   3. Statistical process control
   4. Acceptance sampling plans
   (a) 1, 2 and 3  (b) 1, 3 and 4
   (c) 1, 2 and 4  (d) 2, 3 and 4

Sol–62: (b)
The general area of quality control may be divided into three main subareas:
   (1) Off line quality control
   (2) Statistical process control
   (3) Acceptance sampling plans

63. Which of the following steps come under 14-step plan for quality improvement?
   1. Ad hoc committee for the zero defects program
   2. Cost of quality evaluation
   3. Quantity measurements
   4. Supervisor training
   (a) 1, 2 and 3  (b) 1, 2 and 4
   (c) 1, 3 and 4  (d) 2, 3 and 4

Sol–63: (b)
14 steps to quality improvement for long term process improvement are:
   (1) Management Commitment
   (2) Quality Improvement Plan
   (3) Quality Measurement
   (4) Cost of quality evaluation
   (5) Quality awareness
   (6) Corrective action
   (7) Establish an Ad Hoc committee for the zero defects program
   (8) Supervisor training
   (9) Zero defects day
   (10) Goal setting
   (11) Error cause removal
   (12) Recognition
   (13) Quality councils
   (14) Do it over again

64. An Average Outgoing Quality (AOQ) is
   \[
   AOQ = P_a p \left( \frac{N-n}{N} \right)
   \]
   where
   \[
   P_a = \text{Probability of accepting the lot}
   \]
   \[
   p = \text{Incoming lot quality}
   \]
   \[
   N = \text{Lot size}
   \]
   \[
   n = \text{Sample size}
   \]

Sol–64: (d)

65. Which one of the following is the measure of service quality that correlates with the human factors and behavioural characteristics of service quality?
   (a) Number of complementary responses based on human traits in delivery of service
   (b) Proportion of income tax returns prepared by an agency that have errors
   (c) Shabby appearance of a receptionist in a bank or hotel
   (d) Inadequate temperature control in a convention meeting room

Sol–65: (a)
For service quality characteristic of human factors and behavioural characteristics, the measures of service quality can be number of customer
complaints based on behavioural factors of persons involved in the service process or the number of complementary responses based on human traits in delivery of services.

For service quality characteristic of service non-conformity characteristics, the measures of service quality can be proportion of income tax returns prepared by an agency that have errors for facility related service quality characteristics, the measure of service quality can be inadequate temperature control in a convention meeting room or shabby appearance of a receptionist in a hotel or bank.

66. Which of the following factors affect the quality of conformance in construction?
   1. Site construction methods
   2. Technical specifications
   3. Engineering and design process
   4. Supervision and control

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

   Sol–66: (d)

   Quality of conformance in construction is affected by the following:
   1. Field construction methods—skill of workers, efficiencies of the tools and equipment used and the quality of the materials used.
   2. Supervision that is enforced and the managerial controls applied to direct the working crew to conform to the plans and specifications.
   3. Inspection and quality control procedures that are applied.

67. Which of the following considerations are important during inspection of the work in prestressed concrete works?
   1. Sheathings are threaded properly including correct threading of couplers and taping of joints
   2. Only approved sheathings, HTS strands, anchor heads and wedges are to be used
   3. Splicing of reinforcement to be provided at the joints

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

   Sol–67: (b)

   68. The standard deviation \( \sigma \) for sampling in the case of concrete for construction engineering and management is

   \[
   \sigma = \sqrt{\frac{\sum(X - \bar{X})^2}{N - 1}}
   \]

   where
   \( X_1, X_2, X_3, X_4, \ldots X_n \) = Compressive strengths of the individual cubes
   \( N \) = Number of cubes tested
   \( \bar{X} \) = Average of series of compressive strength values

   Sol–68: (d)

69. Which of the following variations are true in piece part production?
   1. Piece-to-piece variation
   2. Time-to-time variation
   3. Within-piece variation
   4. Process-to-process variation

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

   Sol–69: (d)

   There are three categories of variation in piece part production:

   1. Within-piece variation: This type of variation can be illustrated by the surface roughness of a piece wherein one portion of the surface is rougher than another portion, or the width of one end of a keyway varies from the other end.

   2. Piece-to-piece variation: This type of variation occurs among pieces produced at the same time. Thus, the light intensity of four
consecutive light bulbs produced from a machine will be different.

3. **Time-to-time variation:** This type of variation is illustrated by the difference in product produced at different times of the day. Thus, a service given early in the morning would be different from that given later in the day, or as a cutting tool wears, the cutting characteristics change.

70. Which one of the following is the objective of attribute charts in production process control?
   (a) To determine the acceptance criteria of a product before production
   (b) To evaluate the quality performance of operating and management personnel
   (c) To keep a periodic record of a particular characteristic
   (d) To determine the highest quality level

Sol–70: (b)
The objectives of attribute charts are to
1. Determine the average quality level
2. Bring to the attention of management any changes in the average
3. Improve the product quality by motivating the operating and management personnel to initiate ideas for quality improvement.
4. Evaluate the quality performance of operating and management personnel
5. Determine acceptance criteria of a product before shipment to the customer.

71. Which one of the following region is characterized by sensitive ecosystems, enhanced occurrences of extreme weather events and natural catastrophes?
   (a) Mountain region
   (b) Evergreen forest region
   (c) Tropical region
   (d) Tundra region

Sol–71: (c)
Tropical region and mountain region are two available options for this question.
Tundra and Evergreen are rejected as they don’t experience enhanced occurrences of extreme weather events and sensitive ecosystems as compared to Tropical and mountain region.

Mountain region is also rejected when compared with tropical region because most of the mountains/hills are found in tropical regions such as Western Ghats, Eastern Ghats, Himalayas etc., which are rich in biodiversity. Also Sensitive ecosystems such as corals are found in tropical region.

And, extreme weather events such as occurrences of natural events such as cyclones, earthquakes and tsunamis are more prevalent in tropical region as compared to Mountain region.

So the most appropriate answer is Tropical region.

72. Which one of the following is an iterative and evolutionary process for achieving sustainable development?
   (a) Flood Control Management (FCM)
   (b) Solid Waste Management (SWM)
   (c) Integrated Coastal Zone Management (ICZM)
   (d) Natural Ecosystem Zone (NEZ)

Sol–72: (c)
Integrated coastal zone management is an iterative and evolutionary process for achieving sustainable development.

73. Which of the following practices are adopted for river basin water resources management?
   1. Soil conservation in catchments of river valley projects and flood-prone rivers.
   2. Soil and land use surveys
   3. Control of shifting cultivation
   4. Deforestation

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

Sol–73: (d)
For the river basin water resources management, practices adopted are:
   a) Reforestation, social forestry
   b) Promotion of organic farming
   c) Control of shifting cultivation
   d) Soil and land use surveys
IES MASTER
Institute for Engineers (IES/GATE/PSUs)

SSC-JE
2019 Prelims
Online Test Series

- Quality questions as per SSC-JE exam syllabus and pattern
- Covers all topics as per SSC-JE Paper-I syllabus
- Designed to make students get into real exam mode
- Get the desired boost in confidence

30 Tests
13 Subject-wise Tests
11 Mixed Subjects Tests
6 Full Length Tests

Starts from 14 Dec, 2019

F-126, Katwaria Sarai, New Delhi-110016 | Call +91 801 00 09955
Email: info@iesmaster.org

H-21, Sector 63, Noida - 201305 | Call 0120 415 1100
Email: info.noida@iesmaster.org | Website: iesmaster.org
e) Soil conservation in catchments of river valley projects and flood prone rivers

f) Zero budget natural farming to control biomagnification and chemical pollution

74. According to the Stokes’ law, the rate of settling of the particles depends on the terminal settling velocity \(v_t\) which is

\[
\frac{gd_p^2}{18 \mu_p} \left( \rho_p - \rho_a \right) \left( 1 + \frac{2C}{d_p P} \right)
\]

(a) \(\frac{gd_p^2}{18 \mu_a} \left( \rho_p - \rho_a \right) \left( 1 + \frac{2C}{d_p P} \right)\)

(b) \(\frac{gd_p^2}{18 \mu_a} \left( \rho_p + \rho_a \right) \left( 1 - \frac{2C}{d_p P} \right)\)

(c) \(\frac{gd_p^2}{18 \mu_a} \left( \rho_p - \rho_a \right) \left( 1 - \frac{2C}{d_p P} \right)\)

(d) \(\frac{gd_p^2}{18 \mu_a} \left( \rho_p + \rho_a \right) \left( 1 + \frac{2C}{d_p P} \right)\)

where
\(d_p =\) particle diameter
\(\rho_p =\) density of particle
\(\rho_a =\) density of air
\(\mu_a =\) velocity of air
\(P =\) air pressure
\(C =\) constant

Sol–74: (a)

75. The sound level \(L\) is

\[
L = \log_{10} \frac{Q}{Q_0} \text{ (bels)}
\]

\[
= 10 \log_{10} \frac{Q}{Q_0} \text{ (dB)}
\]

76. Which one of the following is a hygienic way of disposing solid waste and is more suitable if the waste contains more hazardous material and organic content?

(a) Composting  (b) Incineration  (c) Oxidation  (d) Subgrading

Sol–76: (b)

Incineration is a waste treatment process that involves the combustion of organic substances contained in waste materials. Incineration has particularly strong benefits for the treatment of certain waste types in niche areas such as clinical wastes and certain hazardous wastes where pathogens and toxins can be destroyed by high temperatures.

77. NEPA stands for

(a) National Ecological Physical Area  (b) Natural Environmental Policy Act  (c) National Environmental Policy Act  (d) Natural Ecological Primary Area

Sol–77: (c)

NEPA stands for National Environmental Policy Act.

78. Which one of the following gases is colourless with strong odour, irritates mucous membranes at common levels, can cause cough, fatigue and interference with lung functions at higher concentration?

(a) Carbon monoxide  (b) Hydrogen  (c) Ozone  (d) Nitrogen

Sol–78: (c)

Ozone has a very strong odour and is colorless to pale blue gas depending upon its ppm levels.
It causes various health problems such as chest pain, coughing, throat irritation, and irritation in mucous membranes at higher concentration. It also can reduce lung function and harm lung tissue, causes bronchitis, emphysema, and asthma.

Hence Ozone is the closest answer to this question.

79. Basel convention provides
(a) Indian standards for pollution measurement and prevention
(b) International guidelines to control the transboundary movements of hazardous wastes between different countries
(c) Indian standards for the disposal of municipal and industrial wastes
(d) International standards to categorize pollution in air and wastewater

Sol–79: (b)

Basel Convention Provides:
1. the reduction of hazardous waste generation and promotion of environmentally sound management of hazardous waste wherever the place of disposal.
2. The restriction of transboundary movements of hazardous wastes except where it is received to be in accordance with the principles of environmentally sound management.
3. A regulatory system applying to cases where transboundary movement is possible.

80. Which of the following are the suggested ways of reducing NO\textsubscript{x} emissions from stationary sources?
1. By reducing the peak temperature
2. By increasing the availability of N\textsubscript{2} for reaction with O\textsubscript{2}
3. By minimizing the availability of O\textsubscript{2} for reaction with N\textsubscript{2}
(a) 1 and 2 only (b) 1 and 3 only (c) 2 and 3 only (d) 1, 2 and 3

Sol–80: (b)

Suggested ways to reduce NO\textsubscript{x} emissions from stationary sources are:
1) Reducing flame temperatures
2) Reducing excess air and/or burning low nitrogen containing fuels
3) By minimizing the availability of Oxygen for reaction with Nitrogen

81. What is TADF?
(a) Technology Acquired Desired Firm
(b) Technologically Advanced Direct Fund
(c) Technologically Accomplished Direct Fund
(d) Technology Acquisition and Development Fund

Sol–81: (d)

TADF stands for Technology acquisition and development fund.

82. Technical textiles are
(a) the high-tenacity fibres which are lightest and toughest fabrics mainly used in automobile and aerospace industries
(b) the toughest fabrics which are much heavier than polyester and used in power industries
(c) the toughest fabrics having rigidity mainly used in polyhouse construction
(d) the high-tenacity fabrics having fire resistance property

Sol–82: (d)

83. Which one of the following is a measure of sustainable income level that can be secured without decreasing the stock of natural assets?
(a) Natural Capital Stock
(b) Environmental value
(c) Green Accounting
(d) Social discount rate

Sol–83: (c)

Green accounting is a condition of sustainable development.

It allows the computation of a nation’s income by including the factors of economic damage and depletion in natural resource base of a country.

In other words, it is a measure of sustainable income level that can be secured without decreasing the stock of natural assets.
84. Which one of the following is a resource allocation as per Chenery’s development process?
(a) Investment
(b) Structure of domestic demand
(c) Labour allocation
(d) Government revenue

Sol–84: (b)
Chenery’s model requires a change of the existing structures in an underdeveloped economy so that the new industries and modern structures can penetrate to attain the status of an industrial nation.
It states that investment and savings although necessary are not enough to drive the degree of growth that is required.
It adopts four main strategies to achieve economic growth:
• Transformation of production from agricultural to industrial production
• Changing composition of the consumer demand from emphasis on food commodities and other consumables to desire for multiple manufactured goods and services
• International trade; creating a market for its exports
• Using resources as well as changes in socio-economic factors as the distribution of the country’s population.

85. Which one of the following ratios is referred to as everything that has been invested in the past and to the whole income?
(a) Capital-output ratio
(b) Average capital-output ratio
(c) Incremental capital-output ratio
(d) Marginal ratio

Sol–85: (b)
Capital output ratio is defined as total amount of capital required to produce one unit of output (Economic growth). For example the total investment (capital) is 30% of GDP, & the economic growth corresponding to this investment is 7%.
So the Capital Output ratio is 30/7= 4.28.

Average capital-output ratio is the ratio of total investment made in the past in the economy to the total income generated (GDP growth rate). (as per the question)

Incremental Capital Output Ratio (ICOR) is defined as the additional unit of capital/investment required to produce an additional unit of output (economic growth or GDP growth).
Thus, this ratio changes with increase in investment.

86. Which one of the following methods of planning is an attempt to work out the implications of the allocations and product yields so as to maximize income and employment?
(a) Perspective planning
(b) Physical planning
(c) Financial planning
(d) Indicative planning

Sol–86: (c)
Physical planning is defined as an attempt to work out the implication of the development effort in terms of factor allocations and product yield so as to maximize incomes and employment, as per the 2nd Five Year Plan. It is also known as over all long-term planning rather than a short-term planning.

Financial Planning is defined as to remove the disequilibrium between demand and supply in the economy with the aim to avoid inflation and provide economic stability.
Physical targets can be achieved only through financial resources.

Indicative planning has the main objective to solve the problem of imperfect information in market and mixed economies in order to enhance economic performance.

87. Which one of the following reflects an intrinsic or true value for factors or products?
(a) Price inflation
(b) Economy pricing
(c) Penetration pricing
(d) Shadow price
“Consistent Quality, Outstanding Results”

CIVIL ENGINEERING

MECHANICAL ENGINEERING

ELECTRONICS & TELECOMMUNICATION ENGINEERING

ELECTRICAL ENGINEERING

Address: F-126, Katwaria Sarai, New Delhi - 110016 | Call – 80100 09955 | iesmaster.org

Disclaimer: In case of any discrepancies, please contact IES Master at info@iesmaster.org immediately.
Sol–87: (b)
Economic pricing reflects an intrinsic or true value for factors or products.
In Economy pricing margins are very low; overheads like marketing and advertising costs are much reduced. It targets the mass market and high market share.
For Example: Friendly low cost wash detergents such as Nirma.

88. Which one of the following control policies leaves no freedom to private enterprise to buy plant, machinery, raw materials from the country of its choice?
(a) Import control  (b) Export control  
(c) Exchange control  (d) Physical control

Sol–88: (a)
Import control is defined as to control the volume goods coming into a country
The main import restrictions are:
(1) Import duties or taxes imposed on the imported goods to make them costlier
(2) Import licenses/quotas that restrict the total amount of goods imported across the world, or imported from a specific country (related to the question which gives no freedom to private enterprise to buy plant, machinery, raw materials from country of its choice.)
(3) Prohibition that prevents entry of illegal or harmful items.

89. Which one of the following is a particular form of collusive price-fixing behaviour by which firms coordinate their bids on procurement or project contracts?
(a) Predatory pricing  
(b) Horizontal price-fixing (collusion)  
(c) Bid rigging  
(d) Exclusive territory

Sol–89: (c)
Bid rigging is an illegal practice in which firms coordinate their bids to choose the winner of a bidding process while others submit uncompetitive bids.
In bid rigging, the rigged prices are higher than competitive bidding process.
This practice is harmful to consumers and taxpayers who bear the cost of higher prices.

90. Which one of the following is an example of horizontal practice of firm?
(a) Refusal to deal  
(b) Retail price maintenance  
(c) Predatory pricing  
(d) Exclusive territory

Sol–90: (c)
Horizontal Practice of firm is a business strategy where one company takes over another company or removes its competitors that operates at the same level in an industry. For e.g.: Predatory Pricing
Predatory Pricing is also called as undercutting and is an example of horizontal practice of firm.
It is a pricing strategy in which a product or service is set at a very low price with following objectives:
- To gain new customers through loss
- To remove competitors out of the market
- To create barriers for entry of potential new competitors

91. Ten years ago father was 12 times as old as his son and after 10 years father will be 2 times older than his son. The present ages of father and son respectively are
(a) 32 years and 14 years  
(b) 34 years and 14 years  
(c) 32 years and 12 years  
(d) 34 years and 12 years

Sol–91: (d)
Let present age of father = x and son = y
According to question
\[ x - 10 = 12(y - 10) \]
\[ x - 12y = -110 \] ...(1)
\[ x + 10 = 2(y + 10) \]
\[ x - 2y = 10 \] ...(2)
Solving (1) and (2)
\[ x = 34 \]
\[ y = 12 \]
92. A number of friends decided to go on a picnic and planned to spend Rs 96 on eatables. Four of them, however, did not turn up. As a consequence, the remaining ones had to contribute Rs 4 each extra. The number of those friends who attended the picnic is
(a) 8  (b) 12  (c) 16  (d) 20

Sol–92: (a)
Let n friends decided to attend the picnic. So according to the question.
\[ \frac{96}{n} = \frac{96 + 4n - 384}{n} \]
\[ \Rightarrow 96 = 96 + 4n - 384 \]
\[ \Rightarrow n^2 - 4n - 96 = 0 \]
\[ \Rightarrow n = 12 \]
So, the number of students who attended picnic = 12 – 4 = 8

93. Consider the following gold articles P, Q, R, S and T with different weights:
- P weighs twice as much as Q
- Q weighs four and a half times as much as R
- R weighs half as much as S
- S weighs half as much as T
- T weighs less than P but more than R

Article T will be lighter in weight than
(a) P and S  (b) P and R  (c) P and Q  (d) Q and R

Sol–93: (c)
P = 2Q....(1)
Q = \frac{4}{2}R
Q = \frac{9}{2}R ....(2)
R = \frac{S}{2} ....(3)
S = \frac{T}{2} ....(4)
R < T < P
Option (a) P and S is incorrect because S=T/2 (From eqn. (4)]
T = 2S
Option (b) P and R is incorrect.

94. Consider the rectangle ABCD with \( \frac{DE}{DC} = \frac{1}{3} \) in the figure
When the area of the triangle ADE is 20 cm\(^2\), the area of the rectangle ABCD will be
(a) 60 cm\(^2\)  (b) 80 cm\(^2\)  (c) 100 cm\(^2\)  (d) 120 cm\(^2\)

Sol–94: (d)
Let \( AB = x \) and \( AD = y \)
So, \( DE = \frac{x}{3} \)
Area of triangle ADE = \( \frac{1}{2} \times \frac{x}{3} \times y = \left( \frac{xy}{6} \right) \)
\( \frac{xy}{6} = 20 \)
\( xy = 120 \) ....(1)
Which is area of rectangle ABCD.

95. Four metal rods of lengths 78 cm, 104 cm, 117 cm and 169 cm are to be cut into parts of equal length. Each part must be as long as possible. The maximum number of pieces that can be cut will be
(a) 27  (b) 36  (c) 43  (d) 52

Sol–95: (b)
H.C.F. (78, 104, 117, 169) = 13
The maximum number of pieces of equal length (13 cm)

\[
= \frac{78}{13} \times \frac{104}{13} + \frac{117}{13} + \frac{169}{13} \\
= 6 + 8 + 9 + 13 = 36
\]

96. A man walked 3 km towards East, then 5 km towards North-East, then 8 km towards South and finally 5 km towards North-East direction. The distance of his present location from the starting point will be
(a) 9 km  (b) 11 km  (c) 15 km  (d) 21 km

Sol–96: (b)

In triangle AMB

\[
AM = \frac{5}{\sqrt{2}} \\
BM = \frac{5}{\sqrt{2}}
\]

In triangle CND

\[
ND = \frac{5}{\sqrt{2}} \\
NC = \frac{5}{\sqrt{2}}
\]

Now, coordinates of final point D.

\[
x = 3 + AM + ND \\
y = (MN) = -\left(8 - \frac{5}{\sqrt{2}} + \frac{5}{\sqrt{2}}\right) \\
= -8 + 5\sqrt{2}
\]

Distance OD = \[\sqrt{(3 + 5\sqrt{2})^2 + (-8 + 5\sqrt{2})^2}\]

\approx 11 \text{ [Approx. value]}

97. A clock strikes once at 1 o'clock, twice at 2 o'clock, thrice at 3 o'clock and so on. The number of times it strikes in 24 hours will be
(a) 116  (b) 136  (c) 156  (d) 196

Sol–97: (c)

The number of times it strikes in 24 hrs.

\[
= (1 + 2 + 3 + \ldots + 12) + (1 + 2 + 3 + \ldots + 12) \\
= 2 \times \left(1 + \frac{12}{2} \times 12\right) \\
= 12 \times 13 \\
= 156
\]

98. The sum of all the natural numbers between 1 and 101 which are divisible by 5 is
(a) 1000  (b) 1050  (c) 1500  (d) 2550

Sol–98: (b)

Sum = (5 + 10 + 15 + \ldots + 100) \\
= 5 \left(1 + 2 + 3 + \ldots + 20\right) \\
= 5 \left(\frac{(1 + 20) \times 20}{2}\right) \\
= 5 \times 21 \times 10 \\
= 1050

99. In a group of 1000 people, 750 speak Hindi and 400 speak English. The number of only Hindi speaking people is
(a) 150  (b) 350  (c) 600  (d) 750

Sol–99: (c)

Use Venn Diagram. Let x people use both Hindi and English.
100. Consider the following students in an examination:

- A scored more than B
- C scored as much as D
- E scored more than F
- B scored more than C
- F scored more than D

Who scored the lowest?

(a) E  (b) C  (c) D  (d) F

Sol–100: (a)

E > B  ...(1)
C = D  ...(2)
E < F  ...(3)
B > C  ...(4)
F > D  ...(5)

From equation (ii) C = D so option (b) and (c) cannot be right choice and among E and F, E scored less than F. Hence E scored minimum.