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T.B.C. : PNGE-U-GEA **Test Booklet Series**

Serial No.

0064529

TEST BOOKLET

PAPER I

GENERAL STUDIES AND ENGINEERING APTITUDE

A

Time Allowed : Two Hours ***Maximum Marks : 200***

INSTRUCTIONS

1. IMMEDIATELY AFTER THE COMMENCEMENT OF THE EXAMINATION, YOU SHOULD CHECK THAT THIS TEST BOOKLET ***DOES NOT*** HAVE ANY UNPRINTED OR TORN OR MISSING PAGES OR ITEMS, ETC. IF SO, GET IT REPLACED BY A COMPLETE TEST BOOKLET.
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3. You have to enter your Roll Number on the Test Booklet in the Box provided alongside. ***DO NOT*** write ***anything else*** on the Test Booklet.
4. This Test Booklet contains 100 items (questions). Each item comprises four responses (answers). You will select the response which you want to mark on the Answer Sheet. In case, you feel that there is more than one correct response, mark the response which you consider the best. In any case, choose ONLY ONE response for each item.
5. You have to mark your responses ONLY on the separate Answer Sheet provided. See directions in the Answer Sheet.
6. All items carry equal marks.
7. Before you proceed to mark in the Answer Sheet the response to various items in the Test Booklet, you have to fill in some particulars in the Answer Sheet as per instructions sent to you with your Admission Certificate.
8. After you have completed filling in all your responses on the Answer Sheet and the examination has concluded, you should hand over to the Invigilator ***only the Answer Sheet***. You are permitted to take away with you the Test Booklet.
9. Sheets for rough work are appended in the Test Booklet at the end.
10. **Penalty for wrong Answers :**

    THERE WILL BE PENALTY FOR WRONG ANSWERS MARKED BY A CANDIDATE.

    (i) There are four alternatives for the answer to every question. For each question for which a wrong answer has been given by the candidate, **one-third** of the marks assigned to that question will be deducted as penalty.

    (ii) If a candidate gives more than one answer, it will be treated as **wrong answer** even if one of the given answers happens to be correct and there will be same penalty as above to that question.

    (iii) If a question is left blank i.e. no answer is given by the candidate, there will be **no penalty** for that question.

1. The standard deviation of the exponential distribution of

$$f_X(x)=\begin{cases}\lambda e^{-\lambda x}, & x\geq 0\\ 0, & x<0\end{cases}$$ is

(a) $\frac{1}{\lambda}$

(b) $\frac{2}{\lambda^2}$

(c) $\frac{3}{\lambda^3}$

(d) $\frac{2}{\lambda^3}$

2. Suppose that 0·1% of the people in a certain area have a disease D and that a mass screening test is used to detect cases. The test gives either a positive or a negative result for each person. Ideally, the test would always give a positive result for a person who has D, and would never do so for a person who has not. In practice the test gives a positive result with probability 99·9% for a person who has D, and with probability 0·2% for a person who has not. What is the probability that a person for whom the test is positive actually has the disease ?

(a) $\frac{1}{3}$

(b) $\frac{5}{3}$

(c) $\frac{4}{3}$

(d) $\frac{2}{3}$

3. Let the random variables X and Y have joint density function given by

$$f_{X,Y}(x,y)=\begin{cases}c(1-y), & 0\leq x\leq y\leq 1\\ 0, & \text{otherwise}\end{cases}$$

Then the marginal density function for X is

(a) $f_X(x)=6\left(\frac{1}{2}-x-\frac{x^2}{2}\right)$ for $0\leq x\leq 1$

(b) $f_X(x)=6\left(\frac{1}{2}+x+\frac{x^2}{2}\right)$ for $0\leq x\leq 1$

(c) $f_X(x)=6\left(\frac{1}{2}+x-\frac{x^2}{2}\right)$ for $0\leq x\leq 1$

(d) $f_X(x)=6\left(\frac{1}{2}-x+\frac{x^2}{2}\right)$ for $0\leq x\leq 1$

4. The continuous-time signal $f(t)=e^{-2\omega t}$, where ω is a real constant, is sampled when $t\geq 0$ at intervals T. What is the z transform of the resulting sequence of samples ?

(a) $\frac{z}{z-e^{-2\omega T}}$

(b) $\frac{z}{1-e^{-2\omega T}}$

(c) $\frac{z}{z-e^{-\omega T}}$

(d) $\frac{z}{z-e^{2\omega T}}$

5. If $(z)=\frac{z}{z^2-z+1}$, then the inverse z transform of $Y(z)$ is

(a) $\sqrt{\frac{1}{3}}\sin\frac{1}{3}k\pi$

(b) $2\sqrt{\frac{1}{3}}\sin\frac{1}{3}k\pi$

(c) $2\sqrt{\frac{1}{3}}\cos\frac{1}{3}k\pi$

(d) $2\sqrt{\frac{1}{3}}\sin k\pi$

6. The temperature distribution $T(x)$ at a distance x, measured from one end, along a bar of length L is given by $T(x)=Kx(L-x)(0\le x\le L)$, $K=$ constant. A Fourier series expansion consisting of sine terms only for $T(x)$ is

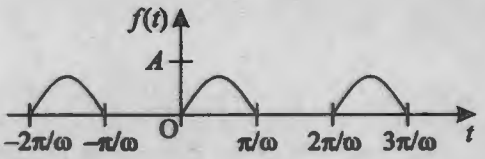
(a) $\frac{8KL^2}{\pi^3}\sum_{n=1}^{\infty}\frac{1}{(2n-1)^3}\sin\frac{(2n-1)\pi x}{L}$

(b) $\frac{8KL^2}{\pi^3}\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}\sin\frac{(2n-1)\pi x}{L}$

(c) $\frac{8KL^3}{\pi^3}\sum_{n=1}^{\infty}\frac{1}{(2n-1)^3}\sin\frac{(2n-1)\pi x}{L}$

(d) $\frac{8KL^3}{\pi^3}\sum_{n=1}^{\infty}\frac{1}{(2n-1)^2}\sin\frac{(2n-1)\pi x}{L}$

7. Passing a sinusoidal voltage $A\sin\omega t$ through a half-wave rectifier produces the clipped sine wave shown in the following figure.



A Fourier series expansion of the rectified wave is

(a) $f(t)=\frac{A}{\pi}\left[1+\frac{\pi}{2}\sin\omega t+2\sum_{n=1}^{\infty}\frac{\cos 2n\omega t}{4n^2-1}\right]$

(b) $f(t)=\frac{A}{\pi}\left[1+\frac{\pi}{2}\sin\omega t-2\sum_{n=1}^{\infty}\frac{\cos 2n\omega t}{4n^2-1}\right]$

(c) $f(t)=\frac{A}{\pi}\left[1-\frac{\pi}{2}\sin\omega t-2\sum_{n=1}^{\infty}\frac{\cos 2n\omega t}{4n^2-1}\right]$

(d) $f(t)=\frac{A}{\pi}\left[1-\frac{\pi}{2}\sin\omega t+2\sum_{n=1}^{\infty}\frac{\cos 2n\omega t}{4n^2-1}\right]$

8. What is the contour integral $\int_C z^2 dz$ along the path C from $-1+j$ to $5+3j$ and composed of two straight line segments, the first from $-1+j$ to $5+j$ and the second from $5+j$ to $5+3j$?

(a) $-4+\frac{196}{3}j$

(b) $-4-\frac{196}{3}j$

(c) $4-\frac{196}{3}j$

(d) $4+\frac{196}{3}j$

9. The image in the w plane of the circle $\left|z+\frac{3}{4}+j\right|=\frac{7}{4}$ under the inversion mapping $w=1/z$ is

(a) a circle centre (1/2, 2/3) and radius 7/6

(b) a circle centre (1/2, –2/3) and radius 7/6

(c) a circle centre (–1/2, 2/3) and radius 7/6

(d) a circle centre (–1/2, –2/3) and radius 7/6

10. The plane $x=1$ intersects the paraboloid $z=x^2+y^2$ in a parabola. The slope of the tangent line to the parabola at (1, 2, 5) is

(a) 2

(b) 6

(c) 4

(d) 5

11. Suppose we do not know the path of a hang glider, but only its acceleration vector $a(t)=-(3\cos t)i-(3\sin t)j+2k$. We also know that initially (at time $t=0$) the glider departed from the point (4, 0, 0) with velocity $v(0)=3j$. What is the glider's position as a function of t?

(a) $r(t)=(1+3\cos t)i-3\sin tj+t^2k$

(b) $r(t)=(-1+3\cos t)i+3\sin tj+t^2k$

(c) $r(t)=(1-3\cos t)i+3\sin tj+t^2k$

(d) $r(t)=(1+3\cos t)i+3\sin tj+t^2k$

12. What is the absolute minimum value of $f(x, y)=2+2x+4y-x^2-y^2$ on the triangular region in the first quadrant bounded by the lines $x=0$, $y=0$, and $y=9-x$?

(a) –11

(b) –43

(c) –61

(d) –41

13. What is the centroid ($\delta=1$) of the solid enclosed by the cylinder $x^2+y^2=4$, bounded above by the paraboloid $z=x^2+y^2$, and bounded below by the xy-plane?

(a) $\left(0,0,\frac{3}{4}\right)$

(b) $\left(0,0,\frac{4}{3}\right)$

(c) $\left(0,0,\frac{5}{4}\right)$

(d) $\left(0,0,\frac{4}{5}\right)$

14. What is the integral

$$\int_1^2 \int_{1/y}^{y} \sqrt{\frac{y}{x}} e^{\sqrt{xy}} dxdy \text{ ?}$$

(a) $2e(e+2)$

(b) $2e(1-e)$

(c) $2e(e-2)$

(d) $2e(1+e)$

15. Fourier transform of

$$f(t)=\begin{cases} \sin at, & |t| \le \pi/a \\ 0, & |t| > \pi/a \end{cases} \text{ is}$$

(a) $\dfrac{2j\sin \pi\omega/a}{-a^2-\omega^2}$

(b) $\dfrac{j\sin \pi\omega/a}{-a^2-\omega^2}$

(c) $\dfrac{j\sin \pi\omega/a}{a^2-\omega^2}$

(d) $\dfrac{2aj\sin \pi\omega/a}{\omega^2-a^2}$

16. Brianna, Ryan, Tyler, and Ashley were recently elected as the new class officers (president, vice president, secretary, treasurer) of the sophomore class at Summit College. From the following clues, determine which position each holds.

1. Ashley is younger than the president but older than the treasurer.
2. Brianna and the secretary are both the same age, and they are the youngest members of the group.
3. Tyler and the secretary are next door neighbors.

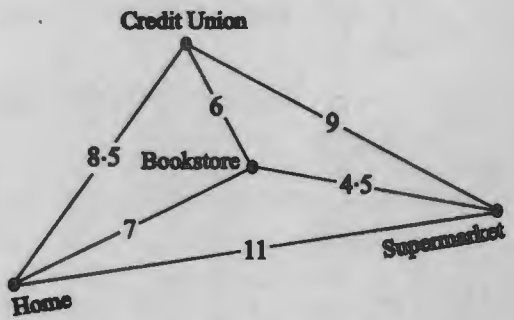
(a) Tyler is the president, Ashley is the vice president, Ryan is the secretary, and Brianna is the treasurer.

(b) Tyler is the president, Ashley is the vice president, Brianna is the secretary, and Ryan is the treasurer.

(c) Tyler is the president, Ryan is the vice president, Ashley is the secretary, and Brianna is the treasurer.

(d) Tyler is the president, Ryan is the vice president, Brianna is the secretary, and Ashley is the treasurer.

17. You need to buy groceries at the supermarket, deposit a cheque at the credit union, and purchase a book at the bookstore. You can complete the errands in any order; however, you must start and end at your home. The driving time, in minutes, between each of these locations is given in the following figure.



What is the route whose total driving time is less than 30 minutes ?

(a) home, bookstore, credit union, supermarket, home

(b) home, supermarket, bookstore, credit union, home

(c) home, bookstore, supermarket, credit union, home

(d) home, supermarket, credit union, bookstore, home

18. Each of four siblings (Anita, Tony, Maria and Jose) is given ₹5000 to invest in the stock market. Each chooses a different stock. One chooses a utility stock, another an automotive stock, another a technology stock, and the other an oil stock.

1. Anita and the owner of the utility stock purchased their shares through an online brokerage, whereas Tony and the owner of the automotive stock did not.

2. The gain in value of Maria's stock is twice the gain in value of the automotive stock.

3. The technology stock is traded on NASDAQ, whereas the stock that Tony bought is traded on the New York Stock Exchange.

From the above clues, match the name of the sibling and stock bought.

(a) Maria: the utility stock; Jose: the automotive stock; Anita: the technology stock; Tony: the oil stock

(b) Maria: the utility stock; Anita: the automotive stock; Jose: the technology stock; Tony: the oil stock

(c) Maria: the utility stock; Tony: the automotive stock; Anita: the technology stock; Jose: the oil stock

(d) Jose: the utility stock; Maria: the automotive stock; Anita: the technology stock; Tony: the oil stock

19. If six people greet each other at a meeting by shaking hands with one another, how many handshakes will take place ?

(a) 14

(b) 16

(c) 15

(d) 18

20. Anuhya picks a number. She doubles the number, squares the result, divides the square by 3, subtracts 30 from the quotient, and gets 18. What are the possible numbers that Anuhya could have picked ?

(a) 6 or –6

(b) 16 or –16

(c) 26 or –26

(d) 36 or –36

21. Nothing is known about the personal life of the ancient Greek mathematician Diophantus except for the information in the following :

"Diophantus passed $\frac{1}{6}$ of his life in childhood, $\frac{1}{12}$ in youth, and $\frac{1}{7}$ more as a bachelor. Five years after his marriage was born a son who died four years before his father, at $\frac{1}{2}$ his father's (final) age." How old was Diophantus when he died ?

(a) 64

(b) 54

(c) 74

(d) 84

22. Select a two-digit number between 50 and 100. Add 83 to your number. From this number form a new number by adding the digit in the hundreds place to the number formed by the other two digits (the digits in the tens place and the ones place). Now subtract this newly formed number from your original number, to arrive at the final result. What is the final result ?

(a) 16

(b) 26

(c) 36

(d) 46

23. An activities director for a cruise ship has surveyed 240 passengers. Of the 240 passengers, 135 like swimming, 80 like swimming and dancing, 150 like dancing, 40 like swimming and games, 65 like games, 25 like dancing and games, 15 like all three activities. How many passengers like exactly two of the three types of activities ?

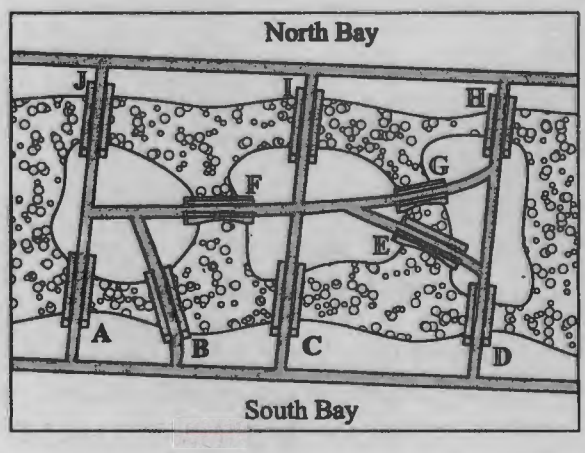
(a) 220

(b) 20

(c) 30

(d) 100

24. The following map shows the 10 bridges and 3 islands between the suburbs of North Bay and South Bay. During your morning workout, you decide to jog over each bridge exactly once. Which one of the following statements is correct ?



(a) You want to start from North Bay and that your workout concludes after you jog over the 'D' bridge.

(b) You want to start from North Bay and that your workout concludes after you jog over the 'E' bridge.

(c) You want to start from North Bay and that your workout concludes after you jog over the 'H' bridge.

(d) You want to start from North Bay and that your workout concludes after you jog over the 'G' bridge.

25. Fifty people were asked to rank their preferences of five varieties of chocolate candy, using 1 for their favorite and 5 for their least favorite. The results are shown in the table below.

	Rankings					
Caramel center	5	4	4	4	2	4
Vanilla center	1	5	5	5	5	5
Almond center	2	3	2	1	3	3
Toffee center	4	1	1	3	4	2
Solid chocolate	3	2	3	2	1	1
Number of voters	17	11	9	8	3	2

According to the table (see the column in grey), three voters ranked solid chocolate first, caramel centers second, almond centers third, toffee centers fourth, and vanilla centers fifth. According to this table, which variety of candy would win the taste test using the plurality voting system ?

(a) Almond centers

(b) Vanilla centers

(c) Toffee centers

(d) Caramel centers

26. The members of a club are going to elect a president from four nominees. In each first-place vote receives 4 points, each second-place vote receives 3 points, each third-place vote receives 2 points, and each last place vote receives 1 point. If the 100 members of the club mark their ballots as shown in the table below, who will be elected president ?

	Rankings					
Avalon	2	2	2	2	3	2
Branson	1	4	4	4	2	1
Columbus	3	3	1	3	1	3
Dunkirk	4	1	3	1	4	4
Number of voters	30	24	18	12	10	6

(a) Avalon

(b) Branson

(c) Columbus

(d) Dunkirk

27. Study the given information carefully and answer the question :

There are seven books, one each of Psychology, Hindi, English, Sociology, Economics, Education and Accountancy lying on a table one above the other. Sociology is on the top of all books. Accountancy is immediately below Education which is immediate below Sociology. Economics is immediately above Psychology but not in the middle. Hindi is immediately below Psychology.

Which three books are between Accountancy and Hindi ?

(a) English, Economics and Psychology

(b) Economics, Psychology and Education

(c) Economics, Psychology and Hindi

(d) Cannot be determined

28. Read the information given below and answer the question :

There is a group of five girls. Hasini is second in height but younger than Madhavi. Pooja is taller than Pranati but younger in age. Madhavi and Pranati are of the same age but Madhavi is tallest among them. Neelam is taller than Pooja and elder to Madhavi.

If they are arranged in the descending order of their ages who will be in fourth position ?

(a) Neelam

(b) Hasini

(c) Pranati

(d) Data inadequate

29. Read the following information and answer the question :

Seven students P, Q, R, S, T, U and V take a series of tests. No two students get similar marks. V always scores more than P. P always scores more than Q. Each time either R scores the highest and T gets the least, or alternatively S scores the highest and U or Q scores the least.

If V is ranked fifth, which one of the following is correct ?

(a) S scores the highest

(b) R is ranked second

(c) T is ranked third

(d) Q is ranked fourth

30. A man has a certain number of small boxes to pack into parcels. If he packs 3, 4, 5 or 6 in a parcel, he is left one, if he packs 7 in a parcel, none is left over. What is the number of boxes, he may have to pack ?

(a) 106

(b) 301

(c) 309

(d) 400

31. Which one of the following transmission media is/are used for the remote control communication for televisions, VCRs, and stereos etc. ?

(a) Fiber optics

(b) Fiber cables

(c) The electromagnetic spectrum

(d) Unguided infrared and millimeter waves

32. Which one of the following protocols is used to wrap IP packets with the additional feature of multiplexing and de-multiplexing multiple processes using a single IP address ?

(a) User Datagram Protocol

(b) Transport Control Protocol

(c) Internet Protocol

(d) Point-to-Point Protocol

33. Which one of the following code modules is/are used where the browser fetches from a special directory on the disk and installs as an extension to itself ?

(a) Uniform Resource Locators

(b) Browser

(c) Plug-in

(d) Client server

34. Which one of the following features is/are used when a website is complex, consisting of many pages produced by multiple authors working for the same company, often desirable to have a way to prevent a different page from having a different appearance ?

(a) Checkbox

(b) Style sheets

(c) Table

(d) Forms

35. Which one of the languages is used to develop the web pages in the structured and for automated processing ?

(a) eXtensible Markup Language

(b) Hypertext Markup Language

(c) eXtended Hyper Text Markup Language

(d) Markup Language

36. Which one of the following interfaces is used to allow web servers to talk to back-end programs and scripts that can accept input and generate HTML pages in response ?

(a) Application Programming Interface

(b) User Interface

(c) Application Interface Marker

(d) Common Gateway Interface

37. Which one of the following status code responses gives the internal server error ?

(a) 200

(b) 500

(c) 100

(d) 300

38. Which of the following issues were addressed while establishing an IT Policy ?

1. Respect of the intellectual rights of others, including trade secrets, copyrights, patents, and trademarks
2. Inappropriate use of IT resources, such as Web surfing, blogging, personal emailing, and other use of computers for purposes other than business
3. The need to protect the security of IT resources through adherence to good security practices, such as not sharing user IDs and passwords, using hard-to-guess passwords, and frequently changing passwords.
4. The use of the computer to intimidate, harass, or insult others through abusive language in emails and by other means.

Select the correct answer using the code given below :

(a) 1 and 3 only

(b) 2 and 3 only

(c) 2, 3 and 4 only

(d) 1, 2, 3 and 4

39. Which one of the following is a harmful program that resides in the active memory of the computer and duplicates itself without human intervention, often sending copies of themselves to other computers by email ?

(a) Worms

(b) Viruses

(c) Bugs

(d) Spam

40. Which one of the following attacks is one in which a malicious hacker takes over computers via the Internet and causes them to flood a target site with demands for data and other small tasks ?

(a) Rootkits

(b) Distributed Denial-of-Service

(c) Phishing

(d) Smishing

41. Which one of the following is a set of programs that enables its user to gain administrator-level access to a computer without the end user's consent or knowledge ?

(a) Distributed Denial-of-Service

(b) Phishing

(c) Smishing

(d) Rootkit

42. Which one of the following is software and/or hardware that monitor system and network resources and activities, and notify network security personnel when it detects network traffic that attempts to circumvent the security measures of a networked computer environment ?

(a) An intrusion detection system

(b) A protection of evidence and activity logs system

(c) A critical internet security threats system

(d) An illusion detection system

43. Which one of the following involves for the examination of Internet records to track down the identity of someone who posted in a discussion forum on one Website might search for clues to the poster's identity on Facebook, Twitter, and other online sources ?

(a) Pornography

(b) Internet filter

(c) Doxing

(d) Internet censorship

44. Which one of the following Acts mandates schools and libraries in India to use some form of technological protection to block computer access to obscene material, pornography, and anything else considered harmful to minors ?

(a) Telecommunications Act

(b) Child Online Protection Act

(c) Children's Internet Protection Act

(d) Communications Decency Act

45. Which of the following Acts is required for the commercial emailers in sending out messages that advertise a commercial product or service ?

(a) Controlling the Assault of Non-Solicited Pornography and Marketing Act

(b) Communications Assistance for Law Enforcement Act

(c) Communications Act of 1934

(d) Communications Decency Act

46. What are the three stages in the Development of Professional Identity ?

(a) Possessing Knowledge, Professional Services, Self-Defining or Integrated Professional

(b) Independent Operator, Professional Services, Self-Defining or Integrated Professional

(c) Possessing Knowledge, Team-Oriented Idealist, Self-Defining or Integrated Professional

(d) Independent Operator, Team-Oriented Idealist, Self-Defining or Integrated Professional

47. The first of the Fundamental Canons of the code of the National Society of Professional Engineers says that engineers shall hold

(a) paramount the safety, health, and welfare of the public

(b) devotion to clients as the first responsibility

(c) devotion to his employer

(d) devotion to the public

48. A very compassionate man, Engineer Bernard Amadei in 2001 was profoundly affected by the poor living conditions in underdeveloped countries, such as the absence of clean water. He founded EWB-USA in 2001 for improving the living condition of the poor. Engineering students in EWB are responsible for many projects throughout the world that have enhanced human well-being. What is the full form of the term EWB ?

(a) Economically Water Boys

(b) Engineers Well to do Boys

(c) Engineers Without Borders

(d) Engineers Water Boys

49. Consider the following statements :

The philosopher W. D. Ross, who constructed a list of basic duties or obligations, which he called prima facie duties. His lists of prima facie duties are given below :

1. Duties resting on previous acts

2. Duties of gratitude, Duties of justice

3. Duties of beneficence, Duties of self-improvement

4. Duties to injure others, unexceptional to be widely practiced

Which of the above statements are correct ?

(a) 1, 2 and 4

(b) 1, 3 and 4

(c) 1, 2 and 3

(d) 2, 3 and 4

50. What are the types of Moral Judgments ?

(a) Permissible, Intent, Obligatory, Standpoint

(b) Professional, Impermissible, Obligatory, Supererogatory

(c) Permissible, Impermissible, Obligatory, Supererogatory

(d) Professional, Impermissible, Obligatory, Standpoint

51. Which of the following tests are suggested by Philosopher Michael Davis that rely on our commonsense morality, but also reflect some of the concepts in moral theories or approaches ?

(a) Harm Test, Publicity Test, Defensibility Test, Reversibility Test, Virtue Test, Professional Test, Colleague Test and Organization Test

(b) Defensibility Test, Reversibility Test, Virtue Test, Professional Test, Colleague Test, Heat Test, Organism Test and Purity Test

(c) Purity Test, Defensibility Test, Reversibility Test, Professional Test, Colleague Test, Heat Test Organism and Virtue Test

(d) Defensibility Test, Heat Test, Principal Test, Reversibility Test, Virtue Test, Professional Test, Organism Test and Colleague Test

52. If a utilitarian approach requires that we maximize well-being, how should we go about determining the criteria we should use in seeking this maximization ? One approach that has appeal from the engineering perspective is CBA, which holds that the course of action that produces the greatest benefit or utility relative to cost should be chosen. What is the full form of the term CBA ?

(a) Cost Benefit Approach

(b) Competitive Benefit Approach

(c) Competitive Benefit Analysis

(d) Cost Benefit Analysis

53. Joshua B. Kardon presents "an engineer is not liable, or responsible, for damages for every error. Society has decided, through case law, that when you hire an engineer, you buy the engineers normal errors. However, if the error is shown to have been worse than a certain level of error, the engineer is liable". That level, the line between non-negligent and negligent error is called

(a) Engineering Judgment

(b) Normal Distribution

(c) Standard of Care

(d) Performance Relative Standard

54. According to Black's Law Dictionary, the law treats the corporation itself as a person which can

(a) monitor

(b) maintain

(c) sue and be sued

(d) give response

55. Those who drive automobiles are familiar with blind spots. Applying this term to organizational and business arenas, Dennis Moberg draws an analogy between business blind spots and those we experience when driving. Blind Spot is one of the significant common impediments to responsibility. Which one of the following is NOT the method under Blind Spot ?

(a) Self-deception

(b) Willful blindness

(c) In-attentional blindness

(d) Illusion of invulnerability of group

56. Which one of the following is NOT a factor for large scale diversification into unrelated areas by some of the industry Conglomerate in India ?

(a) Restriction in growth in the existing line of business

(b) Policies with respect to imports, duties, pricing, and reservations

(c) Opening up of newer areas of investments

(d) Desire not to avail tax incentives

57. Boston Consulting Group, the BCG matrix classifies the various businesses in a firm's portfolio on the basis of

(a) Relative Share and Relative Growth Rate

(b) Relative Market Share and Substantial Market Share

(c) Relative Market Share and Relative Market Growth Rate

(d) Substantial Growth Rate and Relative Market Growth Rate

58. What are the factors that contribute to decline in unit cost with respect to the accumulated volume of production ?

(a) Pioneering stage, Rapid growth stage, and Economies of scale stage

(b) Learning effects, Technological improvements, and Economies of scale

(c) Technological improvements stage, Maturity stage, and Decline stage

(d) Pioneering stage, Rapid growth stage, and Decline stage

59. Consider the following statements :

The broad areas of corporate appraisal and the few important aspects to be considered under them are

1. Marketing and Distribution
2. Production and Operation
3. Research and Development
4. Project Rating

Which of the above statements are correct ?

(a) 1, 2, 3

(b) 2, 3, 4

(c) 1, 2, 4

(d) 1, 3, 4

60. Which one of the following methods is an important qualitative method under demand forecasting ?

(a) Jury of Executive Method

(b) Trend Projection Method

(c) Chain Ratio Method

(d) Bass Diffusion Method

61. Why Delphi method of demand forecasting appeals to many organizations ?

(a) The biases underlying are subjective, and it seems to be more accurate and less expensive than the traditional face-to-face group meetings

(b) It is intelligible to users, it is a fancy name, and it seems to be more accurate and less expensive than the traditional face-to-face group meetings

(c) It has immense appeal, the biases underlying are subjective, and it seems to be more accurate and less expensive than the traditional face-to-face group meetings

(d) It is an expedition's method, it has immense appeal, and it seems to be more accurate and less expensive than the traditional face-to-face group meetings

62. Consider the following statements regarding metallic bonding :

1. The metallic sharing changes with time and the bonding electrons resonate between different atoms.
2. The metallic state can be visualized as an array of positive ions, with a common pool of electrons to which all the metal atoms have contributed their outer electrons.
3. These electrons have freedom to move anywhere within the crystal and act like an all-pervasive, mobile glue holding the ion cores together.

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

63. Consider the following statements regarding phase diagram rules for the crystal :

1. According to the Gibbs phase rule, the degree of freedom, (F) = Number of components (C) + Number of Phases (P) + 2.

2. The tie-line rule is applied to determine the compositions of two co-existing phases in a binary phase diagram.

3. In the lever rule, the tie-line at the temperature of interest is treated as a lever arm, with the fulcrum at the overall composition.

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

64. Consider the following statements regarding effect of minor elements on steel properties :

1. Sulphur is present in steel either as iron sulphide or manganese sulphide and during the rolling or forging of steel, iron sulphide present in steel gets cracked/ teared.

2. Silicon, in the form of ferro-silicon, is used widely as a deoxidant due to its low cost and high efficiency.

3. Silicon opposes the presence of iron oxide (FeO) which is very much detrimental to properties of steel.

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. Consider the following statements regarding cast iron :

1. Gray cast irons can be classified depending on the shape of graphite that may be present in the form of either flakes or globules.

2. A class of cast iron known as Malleable obtained by treating molten metal by calcium silicide.

3. Meehanite cast irons have graphite nodules but are produced by heat treating white cast irons.

Which of the above statements are NOT correct ?

(a) 1 and 2 only

(b) 1 and 3 only

(c) 2 and 3 only

(d) 1, 2 and 3

66. Consider the following statements regarding the characteristics of covalent compounds and covalent solids :

1. Covalent compounds are soluble in paraffins.
2. Covalent solids do not form closed-packet structures because the covalent bonds are very strong and rigid.
3. The simplest covalent structure is that of diamond which is fairly open and empty and far from close-packed.

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

67. Consider the following statements regarding the gas carburizing :

1. Case depth can be obtained accurately.
2. More floor space is required than pack carburizing.
3. Process is rapid as less time is required than in pack carburizing.

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

68. Which one of the following statements is NOT correct regarding thermal mass ?

(a) In solar buildings, it reduces temperature variations between day and night

(b) It is useful in ordinary buildings as it serves as a reservoir or sink for both heating and cooling

(c) It provides a means of storing the solar energy that enters through the windows

(d) The heavier a material is available, then the less thermal mass is available

69. Consider the following statements about ethanol :

1. Ethanol is primarily produced from corn and sugarcane.
2. Ethanol provides a major part of the liquid fuel requirement in Brazil.
3. The production of ethanol accounts for around 90% of the production of biofuels in the world.

Which of the above statements is/are correct ?

(a) 1, 2 and 3

(b) 2 and 3 only

(c) 3 only

(d) 1 and 2 only

70. Which one of the following statements is NOT correct regarding carbon dioxide ?

(a) Carbon dioxide is given off when dead organisms and other organic materials decompose

(b) When volcanoes erupt, they give off carbon dioxide that is stored in the mantle

(c) Ocean water releases dissolved carbon dioxide into the atmosphere when water temperature rises

(d) A good amount of carbon in the atmosphere is present as methane gas

71. Match the following lists :

List I	List II
P. Lamarck	1. Evolutionary theory
Q. Lyell	2. Gradual geological processes have gradually shaped Earth's surface
R. Malthus	3. Human population grow faster than the resources they depend on
S. Wallace	4. Inheritance of acquired characteristics

Select the correct answer using the code given below :

	P	Q	R	S
(a)	2	1	4	3
(b)	4	2	3	1
(c)	1	4	3	2
(d)	4	3	1	2

72. What is Chaparral ?

(a) Chaparrals are plants that grow on other plants

(b) Chaparral is a shrub forest biome dominated by densely-growing evergreen shrubs or small trees, such as scrub oak

(c) Chaparrals are temperate biomes that consist mainly of grasses

(d) Chaparrals are aquatic organisms that live on the surface below a body of water

73. The expression of the ability of surfaces to reflect sunlight is known as

(a) the albedo effect

(b) the greenhouse effect

(c) the genshin effect

(d) the permafrost

74. Which one of the following refers to efforts to tailor thousands of items such as cars or hamburgers to specific customers' needs ?

(a) Miniaturization

(b) Mass customization

(c) Reactive mode

(d) Fire-fighting

75. Which one of the following is associated with developing a qualitative and/or quantitative evaluation of how changes to system inputs affect system outputs ?

(a) Define

(b) Measure

(c) Analyze

(d) Control

76. Consider the following advantages of *p*-charting method :

1. Requires only go-no-go data, intuitive.
2. No requirement for pre-tested "standard" units.
3. Accounts for all errors including systematic errors.

Which of the above advantages is/are correct ?

(a) 1 only

(b) 2 only

(c) 1 and 2

(d) 2 and 3

77. Which one of the following is an example of discrete random variables ?

(a) Triangular Distribution

(b) Normal Distribution

(c) Central Limit Theorem

(d) Negative Binomial Distribution

78. Almost all the quality control problems can be solved if the following conditions for manufacturing the product are met :

1. The quality characteristics are within the appropriate specification tolerance limits determined based on customers' requirements.
2. The variability of the quality characteristics is minimized as much as possible.
3. The mean of each quality characteristic is as close as possible to the target value of the characteristic.

Which of the above conditions are correct ?

(a) 1 and 2 only

(b) 2 and 3 only

(c) 1 and 3 only

(d) 1, 2 and 3

79. The manufacturing cost of the components will decrease as a result of using the probabilistic relationship because

(a) manufacturing cost decreases as the tolerance on the quality characteristic decreases

(b) manufacturing cost decreases as the tolerance on the quality characteristic increases

(c) manufacturing cost remains constant as the tolerance on the quality characteristic increases

(d) manufacturing cost increases as the tolerance on the quality characteristic increases

80. It is important to carefully identify the needs and expectations of the customer prior to beginning the design of mechanical device. One of the step in formulating usually quantitative statements of expected performance levels, environmental conditions in which the device must operate, limitations on space or weight, or available materials and components that may be used. These are part of which one of the following elements of design ?

(a) Functions

(b) Evaluation criterias

(c) Design requirements

(d) Drawings

81. What are the functions of axles ?

(a) Support the weight of the mower. Permit easy, rolling movement. Provide for mounting on an axle. Ensure safe operation on flat or sloped lawn surfaces

(b) Support, safely enclose, and protect operating components, including the blade and motor. Accommodate the attachment of two axles and a handle. Permit cut grass to exit the cutting area

(c) Cut blades of grass and weeds while rotating at high speed. Facilitate connection to motor shaft. Operate safely when foreign objects are encountered, such as stones, sticks, or metal pieces

(d) Transfer the weight of mower from the housing to the wheels. Allow rotation of the wheels. Maintain location of the wheels relative to the housing

82. Which one of the following is/are used for drawing curves which cannot be drawn with a compass ?

(a) Scale

(b) Protractor

(c) French curves

(d) Set square

83. A plane, extended if necessary, will meet the reference planes in lines, unless it is parallel to any one of them. These lines are called

(a) Projection lines

(b) Traces of the plane

(c) Dimension lines

(d) Imaginary lines

84. Which of the following are the methods for determining the line of intersection between surfaces of two interpenetrating solids ?

(a) Line method and cutting plane method

(b) Line method and box method

(c) Co-ordinate method and cutting plane method

(d) Co-ordinate method and box method

85. Which one of the following is used for pyramids and cones in which the true length of the slant edge or the generator is used as radius ?

(a) Parallel-line development

(b) Radial-line development

(c) Triangulation development

(d) Approximate method

86. Consider the following statements regarding the Global Peace Index 2023 :

1. Iceland has retained its position as the most peaceful country since the inaugural study in 2008.

2. Five out of the top 10 most peaceful countries in the world are located in Europe.

Which of the above statements is/are NOT correct ?

(a) Both 1 and 2

(b) 1 only

(c) 2 only

(d) Neither 1 nor 2

87. Consider the following statements regarding Henley Passport Index 2023 :

1. Japan holds the title of the world's most powerful passport, granting visa-free access to 192 out of 227 global travel destinations.

2. Three European countries, namely Germany, Italy, and Spain, share the second position, with visa-free access to 190 destinations.

Which of the above statements are NOT correct ?

(a) Both 1 and 2

(b) 1 only

(c) 2 only

(d) Neither 1 nor 2

88. Consider the following statements :

1. India's Goods and Services Tax collection for the month of June 2023 reached ₹1·61 trillion, according to the Ministry of Finance.

2. India received its highest-ever FDI inflow of US$83·57 billion in the fiscal year 2021-2022.

3. The net direct tax collection in the current fiscal year has witnessed a significant growth of 16%, reaching ₹4·75 lakh crore, indicating a surge in economic activity.

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

89. Consider the following statements regarding Hemis Festival :

1. The Hemis Festival in Ladakh is a renowned religious celebration.

2. The Hemis Festival is dedicated to the birth anniversary of Lord Padmasambhava.

3. Hemis Festival offers a mesmerizing experience of Tibetan Tantric Buddhism.

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

90. Ministry of Defence signed contract with which one of the following organizations for Upgraded Super Rapid Gun Mount (SRGM) and other equipment for around 3000 crores ?

(a) DRDO

(b) BHEL

(c) ISRO

(d) BEL

91. Which of the following cities achieved the Guinness World Records by constructing Single Lane Bituminous Concrete Road and longest Double Decker Viaduct with Highway Flyover & Metro Rail ?

(a) Amravati and Nagpur

(b) Mumbai and Ahmedabad

(c) Hyderabad and Bangalore

(d) Gautam Buddha Nagar and Ghaziabad

92. Which one of the following Institutions launched Centre of Data for Public Good (CDPG) for multidisciplinary research, bringing together experts from academia, industry, and Government to harness the power of data to benefit the public ?

(a) IISc

(b) IIT Madras

(c) DRDO

(d) NITI Aayog

93. AstroSat space telescope has crossed a major milestone by detecting 600th Gamma-Ray Burst launched by which one of the following countries ?

(a) USA

(b) Russia

(c) China

(d) India

94. Which one of the following ships does NOT come under Indian Navy's eight ASW Shallow Water Craft project ?

(a) Mahanav

(b) Mahe

(c) Malvan

(d) Mangrol

95. Which Union Ministry announced '5G & Beyond Hackathon 2023' aimed at shortlisting India-focused cutting-edge ideas workable beyond products and solutions ?

(a) Ministry of Science and Technology

(b) Ministry of Communication

(c) Ministry of Micro, Small and Medium Enterprises

(d) Ministry of Electronics and Information Technology

96. "Scheme for Expansion and Modernization of Fire Services in the States" from the allocation of preparedness and Capacity Building Funding Window under the National Disaster Response Fund for strengthening fire services in the States was introduced by which Union Ministry ?

(a) Ministry of Family and Health Affairs

(b) Ministry of Youth Affairs and Sports

(c) Ministry of Defence

(d) Ministry of Home Affairs

97. Aim of exercise 'Nomadic Elephant' is to build positive military relations, exchange best practices, develop interoperability, bonhomie, camaraderie and friendship between India and which one of the following countries ?

(a) Bangladesh

(b) Mongolia

(c) Botswana

(d) South Africa

98. Which one of the following is associated with 'SPRINT Challenges' aimed at giving a boost to the usage of 75 new indigenous technologies/ products in collaboration with Innovations for Defence Excellence, NIIO and Technology Development Acceleration Cell ?

(a) Indian Coast Guard

(b) Indian Air Force

(c) Indian Army

(d) Indian Navy

99. To increase the transparency and consumer awareness and handle the customer complaint a 'Centralised Receipt and Processing Centre' and 'Integrated Ombudsman Scheme' has been set up, these two schemes are related to which one of the following institutions ?

(a) NITI Aayog

(b) DPIIT

(c) ISRO

(d) RBI

100. These days V-CIP is simple, safe and secure. You can complete your V-CIP from wherever you are in India, you only need your PAN card and Aadhaar card. Then, what is the full form of the term "V-CIP" ?

(a) Venture Capital Identification Process

(b) Venture Capital Investment Process

(c) Voice based Customer Identification Process

(d) Video based Customer Identification Process