

105081

D0622E24

Question Booklet
Version Code**A1**

TIMINGS	MAXIMUM MARKS	TOTAL DURATION	MAXIMUM TIME FOR ANSWERING
2.00 PM TO 5.00 PM	100	200 Minutes	180 Minutes

MENTION YOUR DIPLOMA CET NUMBER						QUESTION BOOKLET DETAILS	
						VERSION CODE	SERIAL NUMBER
24DCE	A	9	3	5	7	A1	105081

Dos :

1. This question booklet is issued to you by the invigilator after the 2nd bell i.e., after 1.55 pm.
2. Check whether the DCET Number has been entered and shaded in the respective circles on the OMR answer sheet.
3. The version code and serial number of this question booklet should be entered on the OMR answer sheet and the respective circles should also be shaded completely.
4. The Version Code and Serial Number of this question booklet should be entered on the Nominal Roll without any mistakes.
5. Compulsorily sign at the bottom portion of the OMR answer sheet in the space provided.

DONTs :


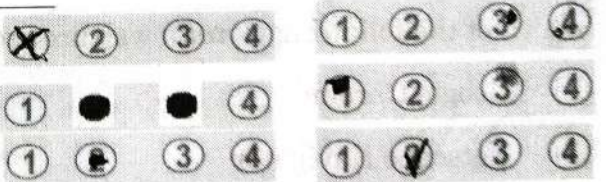
1. **THE TIMING AND MARKS PRINTED ON THE OMR ANSWER SHEET SHOULD NOT BE DAMAGED / MUTILATED / SPOILED.**

2. The 3rd Bell rings at 2.00 pm, till then;

- Do not remove the seal present on the right hand side of this question booklet.
- Do not look inside this question booklet or start answering on the OMR answer sheet.

IMPORTANT INSTRUCTIONS TO CANDIDATES

1. In case of usage of signs and symbols in the questions, the regular textbook connotation should be considered unless stated otherwise
2. This question booklet contains 100 (items) questions and each question will have one statement and four different options / responses & out of which you have to choose one correct answer.
3. After the 3rd Bell is rung at 2.00 pm, remove the paper seal on the right hand side of this question booklet and check that this booklet does not have any unprinted or torn or missing pages or items etc., if so, get it replaced by a complete test booklet. Read each item and start answering on the OMR answer sheet.
4. Completely **darken / shade** the relevant circle with a **blue or black ink ballpoint pen against the question number on the OMR answer sheet.**

ಸರಿಯಾದ ಕ್ರಮ / CORRECT METHOD	ತಪ್ಪು ಕ್ರಮಗಳು / WRONG METHODS
	

5. Please note that even a minute unintended ink dot on the OMR answer sheet will also be recognized and recorded by the scanner. Therefore, avoid multiple markings of any kind on the OMR answer sheet.
6. Use the space provided on each page of the question booklet for Rough Work. Do not use the OMR answer sheet for the same.
7. **After the last bell is issued at 5.00 pm, stop marking on the OMR answer sheet. Hand over the OMR answer sheet to the room invigilator as it is.**
8. After separating the top sheet (Office copy), the invigilator will return the bottom sheet replica (candidate's copy) to you to carry home for self-evaluation.

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(1 - A1)

1. What is the output of the following ?

```
a = 10
if (a > 1) then
    print "TWENTY"
else
    print "TEN"
```

- (1) 10
- (2) TEN
- (3) TWENTY
- (4) No Output

2. The symbol used to connect two parts of a big flowchart is _____.

- (1) Oval
- (2) Rectangle
- (3) Diamond
- (4) Circle

3. Which symbol is used to represent start or stop in a flowchart ?

- (1) Rectangle
- (2) Diamond
- (3) Oval
- (4) Circle

4. What does CSS stand for ?

- (1) Colourful Style Sheet
- (2) Cascading Style Sheet
- (3) Creative Style Sheet
- (4) Computer Style Sheet

5. Which of the following is **not** a web browser ?

- (1) Google Chrome
- (2) Netscape Navigator
- (3) Safari
- (4) Apache

Space for Rough Work

6. What is the correct syntax to change the background colour with CSS ?
- (1) background-color = "purple";
 - (2) background-color : purple;
 - (3) background-color = orange
 - (4) change-background-color : purple
7. Which HTML tag gives a scrolling effect of a given text ?
- (1) <div>
 - (2) <scroll>
 - (3) <marquee>
 - (4) <effect>
8. ERP package will handle _____ business functionality/functionalities.
- (1) One
 - (2) Two
 - (3) Three
 - (4) Multiple
9. Which one is a type of organizational structure ?
- (1) Responsibility structure
 - (2) Behavioural structure
 - (3) Functional structure
 - (4) Relational structure
10. The _____ describes how an actor uses a system to accomplish a particular goal for describing the activities.
- (1) Process case
 - (2) Work case
 - (3) Use case
 - (4) Sub process
11. Which of the following is **not** a characteristic of First-generation ERP system ?
- (1) They were based on mainframe computer.
 - (2) They focused on accounting and finance.
 - (3) They used centralized database.
 - (4) They supported real-time data processing.

Space for Rough Work

12. Which cloud service model enables users to develop, run, manage applications without worrying about underlying infrastructure ?
(1) IAAS (2) PAAS
(3) SAAS (4) NAAS
13. Which of the following is **not** a Google application ?
(1) Google Docs (2) Google Slides
(3) Google Sheets (4) Google Word
14. IoT is a _____.
(1) Network of sensors
(2) Network of objects in a ring structure
(3) Network of virtual objects
(4) Network of physical objects embedded with sensors
15. _____ is a file storage and synchronization service developed by Google which provides complete office tools with cloud storage.
(1) Google Colab (2) Google Drive
(3) Google Meet (4) AWS Cloud
16. Which of the following is **not** a security issue in a personal computer ?
(1) Ransomware Attack (2) Data Breach
(3) Code Injection (4) IoT
17. Which of the following is **not** a firewall ?
(1) Packet filtering
(2) Stateful inspection
(3) Panda
(4) Circuit Level Gateway
18. "S" in HTTPS stands for _____.
(1) Safe (2) Secure
(3) System (4) Server
19. The process used to get an output 43205 from a given input "DCTE" is _____.
(1) Hashing (2) Compression
(3) Decompression (4) Encryption

Space for Rough Work

20. $a = 10$

$b = 20$

$a = a + b$

$b = a - b$

$a = a - b$

The final values of a and b are :

(1) $a = 30, b = 10$

(2) $a = 30, b = 20$

(3) $a = 20, b = 10$

(4) $a = 20, b = 30$

21. Which one of the following is **not** essential for good questionnaires ?

(1) Logically arranged

(2) Avoiding personal questions

(3) Limited number of questions

(4) Unlimited number of questions

22. Both categorical and numerical data variables can be used for _____.

(1) Continuous variable

(2) Class intervals

(3) Distribution of frequency

(4) Frequency distribution table

23. Match the following :

a. Mean

i. = $Q3 - Q1$

b. Absolute value

ii. = AVERAGE (array)

c. IQR

iii. = ABS (cell)

(1) a - i b - ii c - iii

(2) a - ii b - iii c - i

(3) a - iii b - i c - ii

(4) a - i b - iii c - ii

24. _____ type of chart is used to show the relationship between numerical and categorical variable.

(1) Plot

(2) Pie

(3) Bar

(4) Line

Space for Rough Work

$a = 30$
 $b = -10$
 $a = 30$
 $a = 20$
 $b = 10$
 $b = 10$
 $a = 20$

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(5 - A1)

25. Who developed Python language ?

- (1) Zim Den (2) Guido van Rossum
(3) Niene Stom (4) Wick van Rossum

26. Which one of the following is **not** the benefit of data cleaning ?

- (1) Removal of errors when multiple sources of data are at play
(2) Boosts results and revenue
(3) Helps with faster decision-making and more efficient business practices
(4) Consumes more time

27. Is Python code compiled or interpreted ?

- (1) Python code is both compiled and interpreted.
(2) Python code is neither compiled nor interpreted.
(3) Python code is only compiled.
(4) Python code is only interpreted.

28. Which one of the following is **not** a type of interview ?

- (1) Unstructured (2) Semi-structured
(3) Audio recorder (4) Structured

29. The time, in seconds, taken by 180 athletes to run a 110 m hurdle race are tabulated below :

Class	Frequency
13.8 to 14	2
14 to 14.2	4
14.2 to 14.4	15
14.4 to 14.6	74
14.6 to 14.8	36
14.8 to 15	49

The number of athletes who completed the race in less than 14.6 seconds is :

- (1) 19 (2) 95
(3) 131 (4) 180

Space for Rough Work

2
14
15
74
95

30. The higher value of the range represents _____.

- (1) greater spread of the Data
- (2) lesser spread of the Data
- (3) equal to range of the Data
- (4) average of the Data

31. The middle number in a given data set is called :

- (1) Mean
- (2) Mode
- (3) Frequency
- (4) Median

32. _____ is the example of qualitative Data.

- (1) Temperature
- (2) Ability of students
- (3) Prices
- (4) Area

33. Direct personal observation is a method of collection of :

- (1) Secondary Data
- (2) Primary Data
- (3) Mixed Data
- (4) Unpublished Data

34. The in-built function to find the mean of a given data in Excel is :

- (1) = AVERAGE()
- (2) = MEAN()
- (3) = MEDIAN()
- (4) = MODE()

35. The formula for Relative Frequency is :

- (1) Frequency \times No. of observations
- (2) $\frac{\text{No. of observations}}{\text{Frequency}}$
- (3) $\frac{\text{Frequency}}{\text{No. of observations}}$
- (4) No. of observations + Frequency

Space for Rough Work

36. In Python, "str" is a :

(1) Numeric type

(2) Binary type

(3) Text type

(4) Sequence type

37. The results of Python program get displayed in _____.

(1) IDLE 3.1.9 Window

(2) ILDE shell 3.9.1 Window

(3) IDLE shell 3.9.1 Window

(4) ILDE shell 3.1.9 Window

38. The process of Data cleaning is _____.

(1) Removing virus

(2) Deduplication

(3) Survey

(4) Google form

39. Data collected for the first time is called :

(1) Published Data

(2) Mixed Data

(3) Primary Data

(4) Secondary Data

40. The Excel formula for standard deviation of a sample is :

(1) STDEV.P

(2) SDTEV.S

(3) STDEV.S

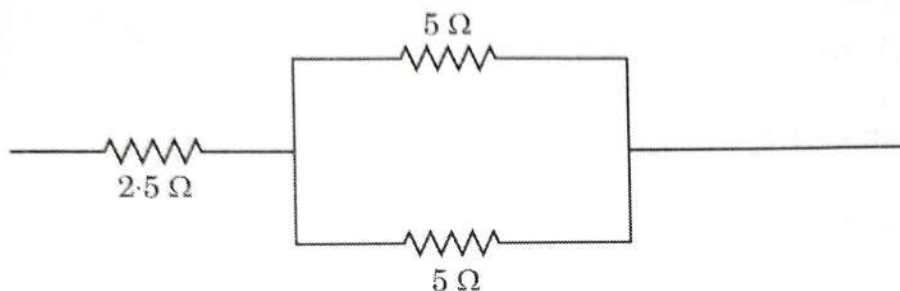
(4) SDTEV.P

Space for Rough Work

41. CPR stands for _____.

- (1) Cardio Permanent Respiration
- (2) Cardio Pulmonary Respiration
- (3) Cardio Pulmonary Resuscitation
- (4) Cardio Pulmonary Retrieval

42. The effective resistance of the circuit below is :



- (1) 0.5 Ω
- (2) 5 Ω
- (3) 2.5 Ω
- (4) 7.5 Ω

43. The relationship between Voltage (V), Current (I) and Resistance (R) is :

- (1) $I = VR$
- (2) $R = VI$
- (3) $V = IR$
- (4) $V = I^2R$

44. ELCB stands for :

- (1) Earth Line Circuit Breaker
- (2) Electric Load Circuit Breaker
- (3) Earth Leakage Circuit Breaker
- (4) Electric Line Circuit Breaker

45. Good fuse wire must have :

- (1) Low melting point
- (2) High melting point
- (3) High resistivity
- (4) High melting point and high resistivity

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(9 - A1)

$$\frac{1}{5} \times \frac{1}{5} = \frac{2}{5}$$
$$\frac{25}{5} = 5$$
$$\frac{10}{25} = \frac{2}{5}$$

46. A 10 HP submersible pump set is used in a borewell for irrigation purpose. It normally uses _____ type of motor.

- (1) Single-phase induction motor
- (2) Three-phase induction motor
- (3) DC motor
- (4) FHP motor

47. SMF in batteries stands for :

- (1) Sealed Moulded-Free
- (2) Semiconductor Maintenance-Free
- (3) Sealed Maintenance-Free
- (4) Solar Maintenance-Free

48. The typical use of LVDT is to sense _____.

- (1) Light intensity
- (2) Humidity
- (3) Pressure
- (4) Temperature

49. A p-n junction diode is a _____.

- (1) Bidirectional Switch
- (2) Unidirectional Switch
- (3) Bidirectional Controlled Switch
- (4) Unidirectional Controlled Switch

50. The purpose of C Filter in a power supply is to _____.

- (1) Degrade regulation
- (2) Reduce ripple
- (3) Reduce gain
- (4) Reduce the chance of an electric shock

Space for Rough Work

51. Lead acid cell is an example of _____.
(1) Secondary cell
(2) Solar cell
(3) Primary cell
(4) Fuel cell
52. Time taken by the alternating quantity to complete one cycle is called _____.
(1) Frequency
(2) Time period
(3) Amplitude
(4) Wavelength
53. What does "PLC" stand for in the context of Industrial Automation ?
(1) Programmable Logic Circuit
(2) Process Logic Controller
(3) Programmable Logic Controller
(4) Processor Logic Circuit
54. Maximum value attained by the alternating quantity either in positive half-cycle or negative half-cycle is called _____.
(1) Frequency
(2) Altitude
(3) Amplitude
(4) Wavelength
55. Which of the following statement is correct ?
(1) In series circuit the current through each resistor is different.
(2) In parallel circuit the voltage across each resistor is same.
(3) In parallel circuit the equivalent resistance is sum of individual resistances.
(4) In series circuit the reciprocal of equivalent resistance is sum of reciprocal of individual resistances.

Space for Rough Work

56. The cell which **cannot** be recharged and reused is _____.

- (1) Secondary cell
- (2) Battery
- (3) Primary cell
- (4) Simple cell

57. Specific gravity of a fully charged lead acid battery will be in the range of _____.

- (1) 1000 to 1210
- (2) 1100 to 1310
- (3) 1150 to 1310
- (4) 1230 to 1300

58. The best sensor for sensing vibration is _____.

- (1) Thermistor
- (2) Thermocouple
- (3) Piezoelectric crystal
- (4) Hygrometer

59. During charging of batteries,

- (1) Chemical energy is converted to Mechanical energy.
- (2) Mechanical energy is converted to Chemical energy.
- (3) Electrical energy is converted to Chemical energy.
- (4) Chemical energy is converted to Electrical energy.

60. When an electric stove is connected across 230 volts, 50 Hz AC supply for the duration of one hour and takes a current of 10 amperes, the energy consumed is :

- (1) 230 units
- (2) 2.3 units
- (3) 23 units
- (4) 0.23 units

Space for Rough Work

$$\begin{array}{r} 52900 \\ 10 \overline{) 52900} \\ \underline{52900} \\ 0 \end{array}$$

(12 - A1)

$$\begin{array}{r} P = \frac{V^2}{R} \\ = \frac{23^2}{R} \\ = \frac{529}{R} \end{array}$$

61. If $A = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$ and $A - B = \begin{bmatrix} 5 & -3 \\ 4 & 6 \end{bmatrix}$, then matrix B is _____.

(1) $\begin{bmatrix} -3 & 2 \\ -4 & -1 \end{bmatrix}$

(2) $\begin{bmatrix} -5 & 3 \\ -4 & -6 \end{bmatrix}$

(3) $\begin{bmatrix} -2 & 1 \\ 0 & -5 \end{bmatrix}$

(4) $\begin{bmatrix} 2 & -1 \\ 0 & 5 \end{bmatrix}$

62. If $\begin{bmatrix} 3 & -4 \\ 9 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 10 \\ 2 \end{bmatrix}$, then the values of x and y are _____.

(1) $\left(\frac{2}{3}, -2\right)$

(2) $\left(2, \frac{2}{3}\right)$

(3) $\left(-2, \frac{2}{3}\right)$

(4) $\left(-\frac{2}{3}, 2\right)$

63. If $A = \begin{bmatrix} -2 & 6 \\ -2 & 3 \end{bmatrix}$, then A^{-1} is _____.

(1) $\frac{1}{18} \begin{bmatrix} 3 & -6 \\ 2 & -2 \end{bmatrix}$

(2) $\frac{1}{6} \begin{bmatrix} 3 & -6 \\ 2 & -2 \end{bmatrix}$

(3) $\begin{bmatrix} 3 & -6 \\ 2 & -2 \end{bmatrix}$

(4) $\frac{1}{6} \begin{bmatrix} -2 & 6 \\ -2 & 3 \end{bmatrix}$

64. If $x + y = 3$ and $2x + 3y = 8$ are the linear equations, then x and y are _____.

(1) $(1, -2)$

(2) $(1, 2)$

(3) $(-1, -2)$

(4) $(-1, 2)$

65. If the straight line is $2y = 3x + 4$, then the y-intercept is _____.

(1) 4

(2) 2

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

(4) -2

Space for Rough Work

$2 \times 2 = 4$

$3x + 4y = 10$

$9x + 2y = 2$

$-6 + 12$
 6

$(13 - A1)$

$\frac{1}{6} \begin{bmatrix} 3 & -6 \\ 2 & -2 \end{bmatrix} \begin{bmatrix} 3x - 2y + 4 \\ 4 \end{bmatrix} = 2$

66. The acute angle of inclination made by the line $3x - 3y - 2 = 0$ with positive x-axis is _____.

(1) 135°

(2) 30°

(3) 45°

(4) 0°

67. The slope of a straight line passing through the points $(1, 2)$ and $(5, -3)$ is _____.

(1) $\frac{5}{4}$

(2) $\frac{1}{6}$

(3) $-\frac{1}{4}$

(4) $-\frac{5}{4}$

68. If the slope of the straight line is $-\frac{3}{2}$ and x-intercept is $\frac{5}{2}$, then the equation of the straight line is _____.

(1) $3x + 2y - 5 = 0$

(2) $3x - 2y - 5 = 0$

(3) $3x + 2y + 5 = 0$

(4) $3x - 2y + 5 = 0$

69. The line perpendicular to the straight line $5x - y + 1 = 0$ and passing through the point $(2, 3)$ is _____.

(1) $x - 5y - 17 = 0$

(2) $x + 5y - 13 = 0$

(3) $x + 5y - 17 = 0$

(4) $x + 5y + 13 = 0$

70. The value of $\cot 660^\circ$ is _____.

(1) $-\frac{1}{\sqrt{3}}$

(2) $\sqrt{3}$

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

(4) $-\sqrt{3}$

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$-\cot 60^\circ$
 $-\frac{1}{\sqrt{3}}$

$\frac{x+5y}{2+15} = \frac{\frac{1}{2}}{\frac{\sqrt{3}}{2}}$

(14 - A1)

$2\cos x + 4\cos e^2 - e^{-x}$
 $2\left(x + \frac{1}{x}\right) - \frac{1}{x^2}$
 $2\frac{x^2+1}{x} - \frac{2x}{x^3}$

71. The value of $\cos 75^\circ$ is _____.

(1) $\frac{\sqrt{3}+1}{2\sqrt{2}}$

(2) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$

(3) $\frac{\sqrt{3}-1}{2\sqrt{2}}$

(4) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$

72. If a ladder is inclined to the wall with base angle 30° , then the angle in radians is _____.

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

(2) $\frac{\pi}{4}$

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

(4) $\frac{\pi}{6}$

73. If $\sin A = \frac{3}{5}$ and $\cos B = \frac{12}{13}$, then $\cos(A - B)$ is _____.

(1) $-\frac{33}{65}$

(2) $\frac{63}{65}$

(3) $-\frac{63}{65}$

(4) $\frac{33}{65}$

74. If $y = 2 \sin x - 4 \cot x + e^{-x} + 7$, then $\frac{dy}{dx}$ is _____.

(1) $-2 \cos x - 4 \operatorname{cosec}^2 x - e^{-x} + 7x$

(2) $2 \cos x + 4 \operatorname{cosec}^2 x - e^{-x}$

(3) $2 \cos x + 4 \operatorname{cosec}^2 x + e^x + 7$

(4) $2 \sin x - 4 \operatorname{cosec}^2 x + e^x$

75. If $y = \left(x + \frac{1}{x}\right)^2$, $\frac{dy}{dx}$ is : _____

(1) $x^2 + \frac{1}{x^2} + 2$

(2) $2x + \frac{1}{x^2}$

(3) $2x - \frac{2}{x^3}$

(4) $2x + \frac{1}{x}$

Space for Rough Work

$\cos 45^\circ \cos 30^\circ$

$\cos 45^\circ \cos 30^\circ + \sin 45^\circ \sin 30^\circ$

$\frac{1}{\sqrt{2}} \cdot \frac{\sqrt{3}}{2} + \frac{1}{\sqrt{2}} \cdot \frac{1}{2}$
 $\frac{\sqrt{3}-1}{2\sqrt{2}}$

$\sin A = \frac{4}{5}$ $\cos A = \frac{3}{5}$

$\sin B = \frac{5}{13}$ $\cos B = \frac{12}{13}$

$\frac{4}{5} \cdot \frac{12}{13} + \frac{3}{5} \cdot \frac{5}{13}$
 $\frac{48}{65} + \frac{15}{65}$

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(15-A1)

81. Which of the following are **not** obstacles in project management ?

- (1) Project complexities
- (2) Project risks
- (3) Changes in technology
- (4) Early identification of problems

82. _____ provides guidance as well as direction to the project and he/she is **not** a part of the project team.

- (1) CEO
- (2) Project Manager
- (3) Team Leader
- (4) Project Consultant

83. Repair of dam in case of damage due to natural calamities is an example of _____.

- (1) Normal project
- (2) Crash project
- (3) Risky project
- (4) Disaster project

84. _____ refers to a detailed description of the expected outcome of a project.

- (1) Project scope
- (2) Project operation
- (3) Project objective
- (4) Project process

85. The process of dividing the project into number of tasks in order to carry out the effective project administration is :

- (1) PPM
- (2) WBS
- (3) PEP
- (4) Project diary

86. The project _____ relieves a project team from most regular work such as planning, tracking and reporting responsibility.

- (1) Manager
- (2) CEO
- (3) Administration
- (4) Leader

87. The use of authority to channelize the activities of the project on desired lines is referred to as _____.

- (1) Project direction
- (2) Project coordination
- (3) Project communication
- (4) Project execution

Space for Rough Work

$$\frac{x^2}{4} + \log x + e^x$$

$$x(-\cos x) - (1)(\sin x) \\ -x \cos x + \sin x$$

~~88.~~ _____ illustrates total project work into divisions of major work packages.

(1) PERT

(2) CPM

~~(3) WBS~~

~~(4) PEP~~

~~89.~~ _____ is a condition wherein a construction or manufacturing project does not complete well within its prescribed time schedule.

(1) Time analysis

(2) Time estimate

~~(3) Time overrun~~

(4) Cost overrun

~~90.~~ A project _____ creates damages or adverse effects to either project activities or project deliverables.

(1) Failure

(2) Undertaken

~~(3) Risk~~

(4) Analysis

~~91.~~ Identify the correct risk analysis which has typically one variable changed at a time.

~~(1) Sensitivity Analysis~~

(2) Scenario Analysis

(3) Best and Worst Case Analysis

(4) Simulation Analysis

~~92.~~ Risk usually _____ as the project progresses.

(1) Increases

~~(2) Reduces~~

(3) Remains same

(4) Becomes negligible

~~93.~~ In 'SMART', the letter R stands for _____.

~~(1) Realistic~~

(2) Reliable

(3) Reasonable

(4) Relation

~~94.~~ _____ is a step-by-step process of collecting, recording and organising information about project results.

(1) Project planning

~~(2) Project evaluation~~

(3) Project scheduling

(4) Project monitoring

Space for Rough Work

$(\sin^2 \theta) (1) - (\cos^2 \theta) \cdot 2$
 $\sin^2 \theta - 2 \cos^2 \theta$

$x + \sin^2 \theta + \frac{1}{A}$

300

95. Which one of the following is **not** a policy of a project ? ☒

- (1) Extent of work given to outside contractors
- (2) Number of contractors to be employed
- (3) Monitoring the progress of project
- (4) Terms of contract

96. In scheduling, 'EST' stands for : ☒

- (1) Easiest Start Time
- (2) Earliest Start Time
- (3) Earliest Schedule Time
- (4) Earliest Schedule Technique

97. _____ is an expert in measuring, confirming, investigating and reporting status of a project. ☒

- (1) Project Guide
- (2) Project Reviewer
- (3) Project Auditor
- (4) Project Advisor

98. _____ is the time estimate if there are no hurdles in an activity. ☒

- (1) Pessimistic time
- (2) Optimistic time
- (3) Most likely time
- (4) Expected estimated time

99. _____ is the last phase of the project life cycle which reports overall achievements of a project in terms of defined performance measures. ☒

- (1) Project closure
- (2) Project initiation
- (3) Project execution
- (4) Project planning

100. The objective of network analysis in a project is to _____. ☒

- (1) Minimise total project duration
- (2) Minimise total project cost
- (3) Minimise production delays
- (4) Minimise manpower requirements

Space for Rough Work