OSSC
ATO
Previous Year Paper
(Mains)
02 Sept, 2024

Do not open the Seal of the Question Booklet until you are asked to

ATDD-2023

Question Booklet Code: **B**

Question Booklet Series No: 444786

Time Allowed: **150 Minutes**

Total Questions: **150**

Maximum Marks: **150**

There shall be negative marking @ **0.25 mark** per question for wrong/multiple answers

Before answering any question, check the booklet that it contains **20 pages** and no page is missing, mutilated or repeated. In case of defect, get it replaced immediately.

INSTRUCTIONS FOR CANDIDATES

1. Fill in the OMR answer sheet, mentioning the Roll No. and other data as required in the place(s) indicated therein. Darken the appropriate circles in blue or black ball point pen only. Do not write any name / surname or put any symbol, sign, slogan, prayer or any mark of identification in the OMR answer sheet. Do not tamper with the bar-code or any other portion of the OMR answer sheet. Any such act is liable to render the answer sheet unfit for evaluation.
2. Correcting fluid, eraser, blade, books, textual material, script notes / loose paper, calculator, docupen, slide rules, log tables / electronic watches, smart watch, cell phone, pager, other electrical/ electronic devices etc, are not allowed inside the examination hall. In case the candidate is found to be in possession of any of the above, he / she shall be expelled from the examination without any enquiry as to whether the same was / were used by the candidate or not.
3. A machine will read the coded information furnished by you in the OMR Answer Sheet. If the information so furnished by you is incomplete or different from what you have given in the application form, you shall be awarded Zero mark.
4. Answer must be given by completely darkening one of the four circles / ovals representing the most appropriate answer given on the Answer Sheet corresponding to the relevant question. For answers not shown by properly darkening in black / blue ball point pen, no marks shall be awarded.
5. No Rough work should be done on the OMR Answer Sheet, Space for rough work has been provided in the Question Booklet itself.
6. After the examination is over, candidates must ensure to fold the OMR Answer Sheet at the perforation and separate the Original Copy and Candidate's Copy of the Two Part OMR Answer Sheet in the presence of the Invigilator and handover the Original Copy to the Invigilator. The Candidate's Copy of the OMR Answer sheet may be taken by the candidate. Failure to hand over the original copy of the OMR Answer Sheet to the Invigilator before leaving the examination hall / room shall make the candidate liable for penal action.
7. Candidates may take with them the respective question-booklet after the examination is over.
8. Failure to comply with or violation of any of the above instructions shall be considered as adopting unfair means and action as deemed proper shall be taken.

SEAL

BASIC ELECTRONICS ENGINEERING

1. A bipolar junction transistor having β=200, then what will be the value of α?

a) 0.79
b) 0.89
c) 0.99
d) 1.9

2. If a modulating signal is represented by Vm = 100 sin 300 t, a carrier signal is represented by Vc = 200 sin 700t and carrier power is 400 w, then what will be total power of AM wave?

a) 400 w
b) 450 w
c) 500 w
d) 800 w

3. If the input to a centre tapped full wave rectifier is 220v, 50Hz, then what will be the O/P frequency of rectifier?

a) 25 Hz
b) 50 Hz
c) 100 Hz
d) 200 Hz

4. Which one of the following is an inverse transducer ?

a) LVDT
b) RTD
c) Piezo electric crystal
d) Thermistor

5. The Shockley equation for a PN diode does not cover which of the following scenarios?

a) Zero bias
b) Forward bias
c) Reverse bias
d) Reverse breakdown

6. A bipolar junction transistor can act as a small signal voltage amplifier in which of the following bias regions?

a) Forward active region
b) Reverse active region
c) Saturation region
d) More than one of the above options is correct

7. Figure 2 shows a circuit consisting of an ideal op-amp. If the input to the circuit is a sine wave of 1 V amplitude, then the steady state amplitude of the output voltage will be:

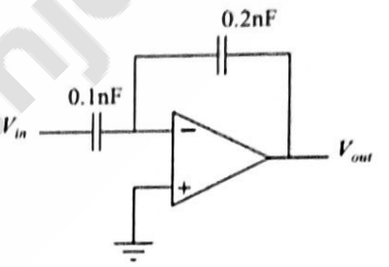


Figure 1

a) 0.5 V
b) 1 V
c) 2 V
d) 4 V

8. Which of the following techniques can reduce the AC ripple at the output of a voltage doubler circuit?

a) Increasing the load resistance
b) Increasing the load capacitance
c) Both (A) and (B)
d) None of the above

9. Which of the following circuits can convert DC to AC?

a) Inverter
b) Rectifier
c) Chopper
d) Boost converter

10. A normal amplitude modulated signal has a carrier frequency of 1 MHz and a message signal of frequency 1 kHz. What will be the signal bandwidth?

a) 2 kHz
b) 1 kHz
c) 1.001 MHz
d) 0.999 MHz

11. The SI unit of the quantity obtained by multiplying resistance and capacitance is:

a) Hertz
b) Seconds
c) Amperes
d) Volts

12. What should be the value of the inductor L in Figure 3, such that the resonance frequency is 1 kHz?

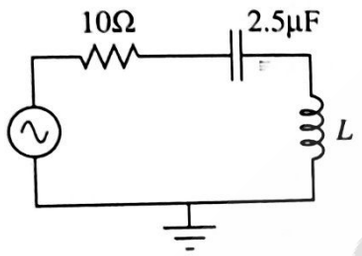


Figure 2

a) 10 μH
b) 100 μH
c) 100 mH
d) 10 mH

13. A superheterodyne receiver is tuned to a carrier signal of frequency 980 kHz. If the intermediate frequency of the receiver is 10 kHz and the carrier is amplitude modulated with voice signals up to 2 kHz, then which of the below image frequencies should the receiver filter out?

a) 960 MHz
b) 990 MHz
c) 984 MHz
d) 976 MHz

14. Which of the below points is not a characteristic of an ideal op-amp?

a) High input impedance
b) Low input impedance
c) Low output impedance
d) High voltage gain

15. A bipolar junction transistor having $\beta = 100$ and operating in the forward active mode has a collector current of 2 mA. What will be the emitter current?

a) 202 μA
b) 20.2 μA
c) 20.2 Ma
d) 2.02 mA

ENTREPRENEURSHIP,MANAGEMENT& SMART TECHNOLOGY

16. An individual who starts, creates and manages a new business is called :

a) Director
b) A manager
c) A entrepreneur
d) A professional

17. Person who works within an organization and is tasked with creation of new / innovative products is called:

a) Entrepreneur
b) Intrapreneur
c) Manager
d) Chief Executive

18. In service sector a micro enterprise is an enterprise where the investment in equipment does not exceed:

a) Rs.10 lakh
b) Rs.15 lakh
c) Rs.20 lakh
d) Rs.25 lakh

19. What is the main purpose of a feasibility study for starting a new venture ?

a) Exploring for potential customers
b) To estimate sales
c) To understand if there are any barriers to success
d) None of the above

20. Grameen Bank by Muhammad Yunus is an example of _____ entrepreneurship.

a) Innovative
b) Social
c) Public
d) Joint

21. IoT stands for :

a) Internet of Technology
b) Incorporation of Things
c) Internet of Things
d) Incorporation of Technology

22. What is IoT ?

a) Network of physical object embedded with sensors
b) Network of virtual objects
c) Network of sensors
d) None of above

23. Which of the following is not an example of Artificial Intelligence & Machine Learning?

a) Ride sharing apps like Uber & Lyft
b) Smart email categorization
c) Plagiarism checkers
d) Booking cinema tickets on book my show/paytm

24. Which of the following is not a designation related to lower level management?

a) Supervisor
b) Section Officer
c) Director
d) Jr. Manager

25. As per Maslow's hierarchy of needs which among the following need is at the top:

a) Physiological
b) Safety
c) Self esteem
d) Self actualization

DIPLOMA LEVEL ENGINEERING DRAWING

26. The standard size of A0 sheet as per BIS in mm is:

a) 841 X 1189
b) 594 X 841
c) 297 X 594
d) 420 X 841

27. The internal angle of a regular pentagon is _____ degree.

a) 72
b) 108
c) 150
d) 120

28. The primary unit of measurement for engineering drawings and design in the mechanical industries is the:

a) Millimeter
b) Centimeter
c) Meter
d) Kilometer

29. If an object lies in third quadrant, its position with respect to reference planes will be:

a) Infront of V.P, above H.P
b) behind V.P., above H.P.
c) behind V.P., below H.P.
d) Infront of V.P., below H.P.

30. Hidden lines are drawn as

a) dashed narrow lines
b) dashed wide lines
c) long-dashed dotted wide line
d) long-dashed double dotted wide line

31. When the projectors are parallel to each other and also perpendicular to the plane, the projection is called _____.
a) perspective projection
b) oblique projection
c) isometric projection
d) orthographic projection

32. The front view of an object is shown on which plane?
a) Profile plane
b) Vertical plane
c) Horizontal plane
d) Parallel plane

33. In 1st angle projection the object is kept in _____.
a) 1st quadrant
b) 2nd quadrant
c) 3rd quadrant
d) 4th quadrant

34. The value of the ratio of isometric length to true length is:
a) 0.141
b) 0.372
c) 0.815
d) 0.642

35. In the isometric view of a cube drawn, the angle between the edge of the cube and the horizontal will be:
a) 15 degrees
b) 120 degrees
c) 45 degrees
d) 30 degrees

36. What is the standard length and width of the arrowhead of dimension lines?
a) 2mm and 2mm
b) 3mm and 1mm
c) 4mm and 2mm
d) 3mm and 2mm

37. Which of the following tools is used to draw horizontal lines?
a) Mini – drafter
b) Protractor
c) T – square
d) French curve

38. Which is the most common drawing tool used to draw circles?

a) French curve
b) Mini – drafter
c) Divider
d) Compass

39. Pencils are graded according to the _____ of the lead.
a) Black or white
b) Smaller or longer
c) Hardness or softness
d) Thick or thin

40. For marking angles, which of the following drawing tool is used?
a) Protractor
b) Divider
c) Compass
d) French curve

ENGINEERING MATHEMATICS-I

41. Value of k for which matrix $A = \begin{bmatrix} \frac{k}{4} & \frac{8}{2k} \end{bmatrix}$ is a singular matrix.
a) 4
b) -4
c) ± 4
d) 0

42. Given that A is a square matrix of order 3 and IAI = -4, then |adjA| is equal to:
a) -4
b) 4
c) -16
d) 16

43. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then $14A^{-1}$ is given by:
a) $14\begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$
b) $\begin{bmatrix} 4 & -2 \\ 2 & 6 \end{bmatrix}$

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

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

44. If tan x = 0 then x = _____

a) (n+1) π
b) (2n+1) π /2
c) n π
d) $n\pi/2$

45. Which of the following is the correct value of cot 10^0 .cot 20^0.cot 60^0.cot 70^0.cot 80^0?

a) $1/\sqrt{3}$
b) $\sqrt{3}$
c) -1
d) 1

46. If the value of $\alpha + \beta = 90^0$, and $\alpha:\beta = 2:1$, then what is the ratio of cos α to cos β?

a) 1:3
b) $\sqrt{3}$: 1
c) 1: $\sqrt{3}$
d) None of the above

47. Find the equation of circle which pass through (5,9) and centre at (2,5).

a) $x^2+y^2+4x-10y+4 = 0$
b) $x^2+y^2+4x-10y+4 = 0$
c) $x^2+y^2+4x+10y+4 = 0$
d) $x^2+y^2+4x-10y-4 = 0$

48. A point on the parabola $y^2=18x$ at which the ordinate increases at twice the rate of the abscissa is:

a) $(\frac{-9}{8}, \frac{9}{2})$
b) (2,-4)
c) (2,4)
d) $(\frac{9}{8}, \frac{9}{2})$

49. If (5,7), (3,p) and (6,6) are collinear, then the value of p is:

a) 3
b) 6
c) 9
d) 12

50. The line parallel to the x-axis and passing through the intersection of the lines ax+2by=3b + 0 and bx-2ay-3a = 0, where (a,b) is NOT equal to (0,0) is:

a) Below the x axis is at a distance 3/2 from it
b) Below the x axis is at a distance 2/3 from it
c) Above the x axis is at a distance 3/2 from it
d) Above the x axis is at a distance 2/3 from it

51. Find the distance between two points (5,6,7) and (2,6,3).

a) 3 units
b) 0 units
c) 4 units
d) 5 units

52. The equation of the plane containing the line 2x – 5y + z = 3; x + y + 4z = 5, and parallel to the plane, x + 3y 6z = 1, is :

a) 2x + 6y + 12z = 13
b) x + 3y + 6z = -7
c) x + 3y + 6z = 7
d) 2x + 6y + 12z = -13

53. Line through origin and parallel to Y-axis is _____

a) x/1 = y/0 = z/0
b) x/0 = y/1 = z/0
c) x/1 = y/0 = z/1
d) x/1 = y/1 = z/0

54. Direction ratio of line joining (2,3,4) and (-1,-2,1), are:

a) (-3, -5, -3)
b) (-3, 1, -3)
c) (-1, -5, -3)
d) (-3, -5, 5)

55. The perpendicular distance from centre of the sphere $x^2+y^2+z^2-y-z-14 = 0$ to the plane $4x-3y+6z-35 = 0$ is

a) $\frac{\sqrt{61}}{3}$
b) $\frac{61}{2}$
c) $\frac{\sqrt{61}}{2}$
d) $\frac{61}{\sqrt{3}}$

COMMUNICATIVE ENGLISH

Directions(Q.56-59) Read the passage carefully and answer the questions that follow.

"I Have a Dream" is a public speech delivered by American civil rights activist Martin Luther King Jr. during the March in Washington for Jobs and Freedom on August 28, 1963, in which he calls for an end to racism in the United States and calls for civil and economic rights for everyone. Delivered to over 250,000 civil rights supporters from the steps of the Lincoln Memorial in Washington, D.C., the speech was a defining moment of the Civil Rights Movement. Beginning with a reference to the Emancipation Proclamation, which freed millions of slaves in 1863, King observes that: "one hundred years later, the Negro still is not free". Toward the end of the speech, King departs from his prepared text for a partly improvised peroration on the theme "I have a dream", prompted by Mahalia Jackson's cry: "Tell them about the dream, Martin!" In this part of the speech, which most excited the listeners and has now become its most famous, King describes his dreams of freedom and equality arising from a land of slavery and hatred. Jon Meacham writes that, "With a single phrase, Martin Luther King Jr. joined Jefferson and Lincoln in the ranks of men who've shaped modern America". The speech was ranked among the top American speeches of the 20th century in a 1999 poll of scholars of public address.

56. What issues does Martin Luther King's speech address?
a) Continuation of racism
b) End to racism and civil and economic rights for everyone
c) Civil rights
d) Civil War

57. What pushes King to speak: "I have a dream"?
a) He reads out the Emancipation Proclamation
b) He is prompted by Mahalia Jackson
c) He is overwhelmed by the crowd
d) Lincoln had asked him to give the speech

58. The words below have been taken from the given paragraph. Which one of these will be a suitable replacement for the phrase "to move away from"?
a) Depart
b) Proclamation
c) Improvised
d) Address

59.What is the name of Martin Luther King's famed speech?
a) the Emancipation Proclamation
b) an Improvisation
c) a Peroration
d) I Have a Dream

60. Choose the most appropriate synonym for 'contemplate'.
a) learn
b) think
c) study
d) forget

61. Which of the following is the antonym for 'vicious'?
a) Passive
b) genial

c) savage
d) Merciless

62. What word is used for someone 'practising living like a hermit'?
a) Troglodyte
b) Raconteur
c) Aesthetic
d) Eclectic

63. Which of the given sentences is grammatically correct?
a) I could not find her anywhere.
b) I have not got none.
c) That is only path to go.
d) He is much weak.

64. Parts of a sentence are given below in jumbled order. Select the option that arranges the parts in the correct order to form a meaningful sentence.
A. with a supreme sense of rhythm and word appeal
B. he was capable of writing angelic or weird poetry
C. or the outlines of an unrelenting plot in a hard and dry style
D. yet he would write down a problem of morbid psychology
a) C, A, B, D
b) B, C, A, D
c) B, A, D, C
d) D, A, B, C

65. Select the option that expresses the given sentence in active voice.
By whom can the problem be solved?
a) Whom can solve the problem?
b) Who can solved the problem?
c) Whom can solved the problem?
d) Who can solve the problem?

66. Which of these sentences has the right number of commas, with each comma in the right place?
a) The wallpaper, which was green, red, and black, was peeling off the walls.
b) The wallpaper, which was green red and black, was peeling off the walls.
c) The wallpaper which was green, red and black was peeling off the walls.
d) The wallpaper which was green, red and black, was peeling off the walls.

67. What is the part of the letter that includes the address and date at the top?
a) Greeting
b) Heading
c) Body
d) Closing

68. Which of the following can be used as a closing in a formal letter?
a) I look forward to hearing from you.
b) I've got to go now. Write soon!
c) Cheers!
d) Call me soon or I'll.

69. The information the receiver gets from the sender in the communication process, is called _____.
a) message
b) output
c) input
d) source

70. _____ communication flows from a superior to a subordinate.
a) Upward
b) Downward
c) Diagonal
d) Lateral

71. Which of the following is an example of non-verbal communication?
a) Speaking on the phone
b) Writing an email
c) Sending a text message
d) Nodding to indicate agreement

72. Which of the following is an example of verbal communication in a business meeting?
a) Table thumping
b) Making eye contact with a colleague
c) Asking a question during a presentation
d) Crossing arms while listening

73. From the options given, choose the most appropriate one to improve the given sentence:
The workers are <u>hell bent at getting</u> what is due to them.
a) hell bent on getting
b) hell bent for getting

c) hell bent with getting
d) hell bent upon getting

74. Choose the correct version of reported speech for the given sentence:

Seema asked me, "Did you see the cricket match on television last night?"

a) Seema asked me whether I saw the cricket match on television the earlier night.
b) Seema asked me whether I had seen the cricket match on television the earlier night.
c) Seema asked me whether I had seen the cricket match on television last night.
d) Seema asked me did I see the cricket match on television the earlier night.

75. What is an essential element of effective public speaking?

a) Speaking as fast as possible
b) Avoiding visual aids
c) Maintaining eye contact with the audience
d) Using complex vocabulary

COMPUTER APPLICATION

76. What will be the output of following C code?

```
#include <stdio.h>
  void main()
  {
    int x = 5;
    if (x > 1)
      printf("hello");
    if (x == 5)
      printf("hi");
    else
      printf("no");
  }
```

a) hello
b) hi
c) no
d) hellohi

77. What will be the output of following C code?

```
#include <stdio.h>
  int main()
  {
    int y = 10000;
    int y = 34;
    printf("Hello World! %d\n", y);
    return 0;
  }
```

a) Compile time error
b) Hello World! 34
c) Hello World! 1000
d) Hello World! followed by a junk value

78. What is *short int* in C programming?

a) The basic data type of C
b) Qualifier
c) Short is the qualifier and int is the basic data type
d) All of the mentioned

79. Which of the following is a type of computer architecture?

a) Microarchitecture

b) Harvard Architecture

c) Von-Neumann Architecture

d) All of the above

80. The addressing mode which makes use of in-direction pointers is _____

a) Indirect addressing mode

b) Index addressing mode

c) Relative addressing mode

d) Offset addressing mode

81. VLSI stands for _____
a) Very Large Scale Integration
b) Very Large Stand-alone Integration
c) Volatile Layer System Interface
d) None of the mentioned

82. Which layer provides the services to the user?
a) physical layer
b) presentation layer
c) session layer
d) application layer

83. What is the full form of OSI?
a) optical service implementation
b) open service Internet
c) open system interconnection
d) operating system interface

84. MFD stands for:
a) Main File Directory
b) Memory File Directory
c) Master File Directory
d) Master Format Directory

85. _____ is composed of two or three characters appended to relative filename separated by a period.
a) status
b) identifier
c) extension
d) descriptor

ENGINEERING PHYSICS

86. The rms speed of oxygen molecules in a gas is v. If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become:
a) v
b) $v/2$
c) $2v$
d) $\sqrt{2}\,v$

87. The electric potential due to a dipole varies with distance (r) as:
a) $1/r$
b) $1/r^2$
c) $1/r^3$
d) $1/\sqrt{r}$

88. An ideal gas is isothermally expanded from volume V_1 to V_2. The work done by the gas is
a) $RT\ \ln(V_1/V_2)$
b) $RT\ \ln(V_2/V_1)$
c) $P(V_2 - V_1)$
d) $P(V_1 - V_2)$

89. A linear wire carrying a uniform charge distribution λ per unit length. The electric field at a distance r from the axis of the wire is:
a) $\frac{\lambda}{2\pi\epsilon_0 r}$
b) $\frac{\lambda}{4\pi\epsilon_0 r}$
c) $\frac{\lambda}{8\pi\epsilon_0 r}$
d) Zero

90. A rigid rod is placed in a two-dimensional plane. What is the number of degrees of freedom of the rod?
a) 2
b) 3
c) 4
d) 5

91. A stone of mass m tied to a string of length ℓ is rotated in a circle with the other end of the string as the centre. The speed of the stone is v. If the string breaks, the stone

will move:

a) towards the centre
b) away from the centre
c) along the tangent
d) will stop

92. The value of gravitational constant on the earth surface is $10m/s^2$. A person flying with a hot air balloon measures value of $g = 9.9m/s^2$. If the radius of the Earth is $6400km$ then the approximate height of the person from the earth surface is:

a) 16
b) 32
c) 64
d) 128

93. A massless spring is suspended from a stiff support, and a mass m is connected to its lower end. Initially, when the influence of gravity is neglected, the system exhibits simple harmonic motion (SHM) with a frequency ω. What will occur to the motion if the influence of gravity is taken into account?

a) The system will not follow SHM
b) The system will follow SHM with a lower value of ω
c) The system will follow SHM with a higer value of ω
d) The system will follow SHM with the same ω

94. A point object is placed at a distance of $20cm$ from a convex mirror of focal length 20 cm. The image will form at:

a) infinity
b) pole
c) focus
d) 10 cm behind the mirror

95. A fully charged capacitor with capacitance C is connected in series with a resistance R. The maximum charge on the capacitor is q_0. Time taken to discharge the charge 50% of its initial value is:

a) Infinity
b) $CR \ln(2)$
c) $CR/\ln(2)$
d) None of the above

ENGINEERING CHEMISTRY:

96. The calomel electrode used as reference electrode contains:

a) PbO_2-$PbSO_4$ mixture
b) Hg_2Cl_2
c) $ZnCl_2$
d) $HgCl_2$

97. Which of the following conditions are satisfied when the cell reaction in an electrochemical cell is spontaneous?

a) $\Delta G > 0$
b) $E_{cell} < 0$
c) $E_{cell} > 0$
d) $\Delta G = 0$

98. In $K_2Cr_2O_7$, the oxidation state of chromium (Cr) is:

a) -6
b) +12
c) 0
d) +6

99. Which of the following is not a Halide mineral?

a) Cryolite
b) Carnalite
c) Calamine
d) Fluorite

100. The SI unit of Avogadro's constant is :

a) mol
b) gm
c) pascal
d) none of the above

101. What is the correct order of orbitals in which electrons are filled?

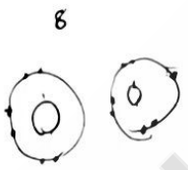
a) 4s, 3d, 4p, 5s, 4d
b) 3d, 4s, 4p, 4d, 5s
c) 3d, 4p, 4s, 4d, 5s
d) 5s, 4p, 3d, 4d, 5s

102. The Heisenberg Principle states that :

a) no two electrons in the same atom can have the same set of four quantum numbers.
b) two atoms of the same element must have the same number of protons.
c) it is impossible to determine accurately both the position and momentum of an electron simultaneously.
d) charged atoms (ions) must generate a magnetic field when they are in motion.

103. In the Lewis structure for the OF_2 molecule, the total number of lone pairs of electrons present is/are:

a) 2
b) 1
c) 8
d) 3



104. Butter is an example of:

a) Water in oil emulsion
b) Oil in water emulsion
c) Oil in oil emulsion
d) None of the above

105. Which of the following hydrocarbons does not have isomers?

a) C_6H_{14}
b) C_3H_8
c) C_4H_8
d) C_5H_{10}

ENGINEERING MATHEMATICS-II

106. Find the angle between the two vectors $\vec{a}$ and $\vec{b}$ with magnitude $\sqrt{3}$ and $\sqrt{2}$ respectively and $\vec{a}.\vec{b} = 3\sqrt{2}$.

a) $\cos^{-1} 1/\sqrt{3}$
b) $\cos^{-1} \sqrt{3}$
c) $\cos^{-1} 3/\sqrt{2}$
d) $\cos^{-1} 2/\sqrt{3}$

107. Let a, b, c be distinct non-negative numbers. If the vectors ai+aj+ck, i+k and ci+ cj+ bk lie in a plane, then c is:

a) Equal to zero
b) The arithmetic mean of a and b
c) The harmonic mean of a and b
d) The geometric mean of a and b

108. If a, b and c are unit vectors, then $|a - b|^2 + |b - c|^2 + |c - a|^2$ does not exceed:

a) 9
b) 8
c) 6
d) 4

109. What is the value of $\lim_{x\to 0}(32x^2 cosec^2 4x)$?

a) 4
b) 3
c) 2
d) 5

110. Is Rolle's theorem valid for $f(x) = x^2 - 3x + 4$ in the interval [1,2]?

a) Depends on x
b) Yes
c) No
d) Data insufficient

111. The function $f(x) = [\ln(1+ax)-\ln(1-bx)]/x$, not defined at x=0. The value that should be assigned to f at x=0, so that it is continuous at x=0, is:

a) a-b
b) b-a
c) In a + In b
d) a+b

112. What is the value of $\frac{d}{dx}(Sinx.tanx)$?

a) sin x + tan x sec x
b) cos x + tan x sec x
c) sin x + tan x
d) sin x + tan x sec^2 x

113. If $f(x) = x^{100} + x^{99} + \ldots + x + 1$, then f'(1) is equal to:

a) 5050
b) 5049
c) 5051
d) 50051

114. Differentiate $y = \ln(2+3x^2)$.

a) dy/dx = 6x
b) dy/dx = 3x/(2+3x)
c) dy/dx = 2/(2+3x^2)
d) dy/dx = 6x/(2+3x^2)

115. $\int \cot^2 x\, dx$ equals to:

a) cot x – x + C
b) -cot x – x + C
c) cot x + x + C
d) -cot x + x + C

116. If $\int 2^x dx = f(x) + C$, then f(x) is:

a) 2^x
b) $2^x \log_e 2$
c) $2^x / \log_e 2$
d) $2^{x+1}/x+1$

117. $\int_1^2 \frac{dx}{x^2}$ equals:

a) 1
b) -1
c) 2
d) $\frac{1}{2}$

118. The order and degree of differential equation

$\left(\frac{d^2y}{dx^2}\right)^6 - 4$ is _____and _____respectively.

a) 2, 6
b) 2, 3
c) 1, 4
d) 2, 12

119. An integrating factor of differential equation

$\frac{dy}{dx} = \frac{1}{x+y+2}$ is:

a) e^x
b) e^{x+y+2}
c) e^{-y}
d) log |x + y + 2|

120. The differential equation which has $y = e^{asinx}$ as general solution (where a is arbitrary constant) is:

a) logy = tanx $\frac{dy}{dx}$
b) ylogy = tanx $\frac{dy}{dx}$
c) ylogy = cosx $\frac{dy}{dx}$
d) logy = cosx $\frac{dy}{dx}$

ENGINEERING MECHANICS

121. The torque of force $F = (2\vec{i} - 3\vec{j} + 4\vec{k})$ newton acting at the point $r = (3\vec{i} + 2\vec{j} + 3\vec{k})$ meter about origin is (in N-m):

a) $6\vec{i} - 6\vec{j} + 12\vec{k}$
b) $17\vec{i} - 6\vec{j} - 13\vec{k}$
c) $-6\vec{i} + 6\vec{j} - 12\vec{k}$
d) $-17\vec{i} + 6\vec{j} + 13\vec{k}$

122. A mass of 1 kg is attached to the middle of a rope, which is being pulled from both ends in the opposite directions. Taking g=10 m/sec^2, the minimum pull required to completely straighten the rope will be:

a) 5 N
b) 20 N
c) 25 N
d) ∞

123. Two stones are dropped from the same height after an interval of two seconds. If the acceleration

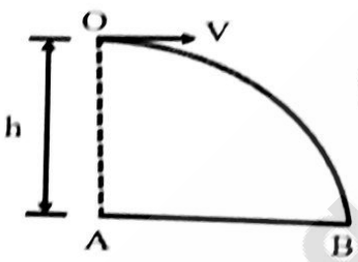
due to gravity g=10 m/sec^2, their separation 5 seconds after the release of first ball would be:

a) 60 m
b) 20 m
c) 80 m
d) 120 m

124. A motorbike starts from rest and accelerates at a rate of 4 m/sec^2 for 10 seconds and then decelerates at 8 m/sec^2 until it stops. The total distance covered is:

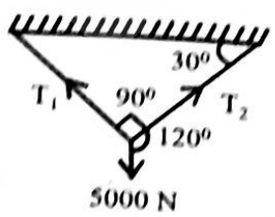
a) 500 m
b) 200 m
c) 100 m
d) 300 m

125. An airplane is flying in a horizontal direction with a velocity 600 km/h at a height of 1960 m. When it is vertically above the point A on the ground, a body is dropped from it. The body strikes the ground at point B. Calculate the distance AB.



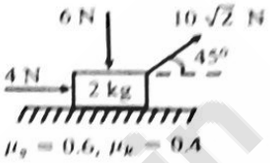
a) 1.24 km
b) 3.33 km
c) 0.25 km
d) 5.23 km

126. A weight of 5000 N is supported by two metallic strings as shown in the given figure. The values of T_1 and T_2 are respectively:



a) 4330 N and 2500 N
b) 2500 N and 4330 N
c) 3535 N and 2500 N
d) 2500 N and 3535 N

127. In the figure shown below, find the force of friction acting on the block and state whether the block will move or not?



a) 14 N, move right
b) 14 N, no motion
c) 16 N, move right
d) 16 N, no motion

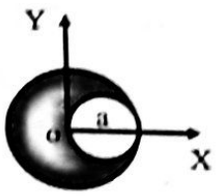
128. Three forces acting on a rigid body are represented in magnitude, direction and line of action by the three sides of a triangle taken in order. The forces are equivalent to a couple whose moment is equal to:

a) Half the area of the triangle
b) Area of the triangle
c) Twice the area of the triangle
d) none of these

129. The coefficient of restitution for inelastic bodies is:

a) one
b) zero
c) between zero and one
d) more than one

130. Find the position of centroid of uniform lamina shown in the figure below.

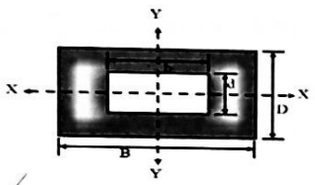


a) $(\frac{a}{6}, 0)$
b) $(\frac{a}{3}, 0)$
c) $(\frac{-a}{6}, 0)$
d) $(\frac{-a}{3}, 0)$

131. If the kinetic energy of the particle is increased by 50%, then find the percentage change in linear momentum.

a) +10%
b) +30%
c) -40%
d) +22%

132. Moment of inertia of a hollow rectangular section as shown in the figure below.



a) $\frac{BD^3}{12} - \frac{bd^3}{12}$
b) $\frac{DB^3}{12} - \frac{db^3}{12}$
c) $\frac{BD^3}{36} - \frac{bd^3}{36}$
d) $\frac{DB^3}{36} - \frac{db^3}{36}$

133. Find the example of simple machine of Type II:

a) cutting plier
b) crow bar
c) forceps
d) Wheelbarrow

134. A weight of 1000 N can be lifted by an effort of 80 N. If the velocity ratio is 20, the machine is said to be:

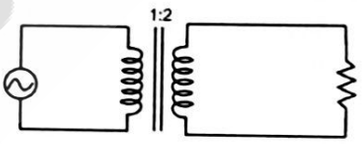
a) Ideal
b) Reversible
c) non-reversible
d) all of the above

135. A body of mass 10 kg revolves in a circle of diameter 0.40 m making 1000 revolutions per minute. Calculate the linear velocity and centripetal acceleration.

a) $(\frac{20\pi}{3}$ m/s, $\frac{2000\pi^2}{9}$ m/s^2)
b) $(\frac{25\pi}{3}$ m/s, $\frac{2500\pi^2}{9}$ m/s^2)
c) $(\frac{30\pi}{4}$ m/s, $\frac{3000\pi^2}{16}$ m/s^2)
d) $(\frac{28\pi}{3}$ m/s, $\frac{2800\pi^2}{9}$ m/s^2)

BASIC ELECTRICAL ENGINEERING

136. A single-phase transformer has a turns ratio 1:2, and is connected to a purely resistive load as shown in the figure. The magnetizing current drawn is 1 A, and the secondary current referred to the primary side is 1 A. If the core losses and leakage reactances are neglected, the primary current is:



a) 1 A
b) 1.41 A
c) 2 A
d) 3 A

137. In case of electrodynamometer wattmeter, the current under measurement is carried by:

a) Both moving and fixed coils
b) Moving coil
c) Fixed coil
d) Neither moving nor fixed coil

138. A 25 Ω resistance has a voltage of $v = 150 \sin 377t$ volts. What will be the average power over one cycle?

a) Zero W
b) 150 W

c) 450 W

d) 900 W

139. In 3-phase induction motor, consider that torque is proportional to $x^2 Isc^2$, where ' x ' is the fraction and ' Isc ' is the starting current with rated voltage. With star-delta starter, the torque is reduced by the fraction ' x ' which is :

a) 1

b) 3

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

d) $\frac{1}{3}$

140. A 250 V DC shunt motor is coupled with DC shunt generator and DC shunt generator is supplying a load of 10 kW. If the efficiency of both motor and generator is 95%, input power taken by the motor is:

a) 10 kW

b) 10.52 kW

c) 11.08 kW

d) 12.2 kW

141. Consider a power system consisting of two generators with load of 1200kW at 60 Hz. The droop of governor of both the generators is 0.05 Hz/kW. If 60 kW load is switched ON, the new operating frequency of the system is (assuming input mechanical power to the generator is constant):

a) 1.5 Hz

b) 3 Hz

c) 58.5 Hz

d) 61.5 Hz

142. At 200 V, 50 Hz supply, moving iron voltmeter takes a current of 0.06671 A and the same instrument takes a current of 0.0669 A at 200 V DC supply. Assuming that meter reads correctly at AC supply, how much meter will read when connected to 200 V DC supply.

a) 200.6 V

b) 199.5 V

c) 200 V

d) None of these

143. An AC generator is supplying a load of 300 kW at a power factor of 0.6 lagging. For the same kVA loading, if the power factor is raised to unity, the additional active power the generator can supply is:

a) 0 kW

b) 500 kW

c) 300 kW

d) 200 kW

144. A current of $10+10\cos^2(wt)$ is flowing through the permanent magnet moving coil (PMMC) meter, the reading of the meter is:

a) 10A

b) 15A

c) 20A

d) 100A

145. For the circuit shown in Figure 1, the total resistance across terminals A and B is :

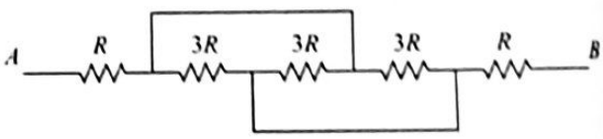


Figure 3

a) R

b) 2R

c) 3R

d) 4R

146. In wiring system, cheapest and simple method is _____ .

a) Cleat wiring

b) Batten wiring

c) Lead concealed wiring

d) Wooden casing capping wiring

147. What should be the smallest cross sectional area of an aluminum conductor for domestic wiring?

a) 1.25 mm^2
b) 1.35 mm^2
c) 1.5 mm^2
d) 2.25 mm^2

148. Transformer ratings are given in _____

a) HP
b) kVAR
c) kW
d) kVA

149. A 38 pole, 3 phase, 80 Hz induction motor is operating at a speed of 12 rpm. The frequency of the rotor current of the motor in Hz is _____.

a) 75.2
b) 76.1
c) 78.2
d) 79.2

150. When the moving coil in a Dynamometer type wattmeter deflects _____.

a) Pointer moves
b) Pointer does not move
c) Current flows
d) Voltage is generated

TENTATIVE ANSWER KEY for MAIN EXAMINATION of ATO Degree Diploma-2024 held on 02-09-2024

A	B	Answer Key
1	76	d
2	77	a
3	78	c
4	79	d
5	80	a
6	81	a
7	82	d
8	83	c
9	84	c
10	85	c
11	86	c
12	87	b
13	88	b
14	89	a
15	90	b
16	91	c
17	92	c
18	93	d
19	94	d
20	95	b
21	96	d
22	97	c
23	98	d
24	99	c
25	100	d
26	101	a
27	102	c
28	103	c
29	104	a
30	105	b
31	106	b
32	107	d
33	108	a
34	109	c
35	110	b
36	111	d
37	112	a
38	113	a
39	114	d
40	115	b
41	116	c
42	117	d
43	118	d
44	119	c
45	120	b
46	121	d
47	122	d
48	123	c
49	124	d
50	125	b

A	B	Answer Key
51	126	a
52	127	b
53	128	c
54	129	b
55	130	c
56	131	d
57	132	a
58	133	d
59	134	b
60	135	a
61	136	c
62	137	a
63	138	c
64	139	d
65	140	c
66	141	c
67	142	a
68	143	d
69	144	b
70	145	c
71	146	a
72	147	c
73	148	d
74	149	b
75	150	a
76	1	c
77	2	b
78	3	c
79	4	c
80	5	d
81	6	d
82	7	a
83	8	c
84	9	a
85	10	a
86	11	b
87	12	d
88	13	a
89	14	b
90	15	d
91	16	c
92	17	b
93	18	a
94	19	c
95	20	b
96	21	c
97	22	a
98	23	d
99	24	c
100	25	d

A	B	Answer Key
101	26	a
102	27	b
103	28	a
104	29	c
105	30	a
106	31	d
107	32	b
108	33	a
109	34	c
110	35	d
111	36	b
112	37	c
113	38	d
114	39	c
115	40	a
116	41	c
117	42	d
118	43	b
119	44	c
120	45	a
121	46	c
122	47	b
123	48	d
124	49	c
125	50	a
126	51	d
127	52	c
128	53	b
129	54	a
130	55	c
131	56	b
132	57	b
133	58	a
134	59	d
135	60	b
136	61	b
137	62	a
138	63	a
139	64	c
140	65	d
141	66	a
142	67	b
143	68	a
144	69	a
145	70	b
146	71	d
147	72	c
148	73	d
149	74	b
150	75	c