

LET - BSc Degree

Question Booklet Version :



Qn. Booklet No. : **25016**

Roll Number :

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INSTRUCTIONS TO CANDIDATES

1. Fill in the OMR sheet carefully as per the instructions given on the back of the OMR Sheet / Admit Card. OMR sheet not correctly filled in will not be valued.
2. Write your Roll Number (all eight digits) and Version as A on the Question Booklet and on the left hand side of the OMR sheet (basic data part).
3. The examination consists of 120 Objective type multiple choice questions, which are to be answered in 120 minutes.
4. After opening the Question Booklet ensure that there are 120 Questions and that the printing of all the questions are legible. If there are any missing or illegibly printed questions, the matter may be reported to the Invigilator immediately
5. There are 4 options (A, B, C & D) for each objective type question. Mark the most appropriate answer to each question by blackening fully the corresponding bubble in the OMR sheet with a black/blue ink ball point pen. **For every correct answer 1 mark will be awarded. No deduction of mark will be made for incorrect answer and unanswered questions.** Marking of more than one bubble against a question number in the OMR sheet shall be considered as an incorrect answer. Erasing, overwriting, partial marking, etc. shall also be treated as incorrect answer.
6. Rough work and calculations can be made in the blank pages attached to the question booklet. Watch, Calculator, Mobile phone, Electronic instruments etc. shall not be allowed in the examination hall.
7. The OMR Sheet and the Hall Ticket should be returned to the Invigilator. The Counterfoil of the Hall Ticket and Question Booklet can be retained by the candidate after the examination.
8. Answer keys will be published on the website www.lbscentre.kerala.gov.in after the examination. Complaints, if any, from the candidates regarding the questions, responses / probable answer may be sent to the Email id lbscentre@gmail.com within 24 hours from the time of publication of the answer keys. Complaints not substantiated with supporting documents will not be considered. However the decision of the experts regarding such complaints on the answer keys shall be final.
9. The Answer sheet of candidates who indulge in malpractice in any form shall not be valued.
10. The candidates will be allowed to leave the hall only after the completion of the examination time and after handing over the Answer sheet to the Invigilator.

SEAL

1. The rank of the matrix $\begin{bmatrix} 0 & 0 & 5 \\ 3 & 5 & 0 \\ 5 & 0 & 0 \end{bmatrix}$
- A) 3
B) 2
C) 1
D) 0
2. Which of the following is a homogeneous system of linear equations?
- A) $x + y - z = 9$, $8y + 6z = -6$, $-2x + 4y - 6z = 40$
B) $x + y - z = 0$, $8y + 6z = -6$, $-2x + 4y - 6z = 0$
C) $x + y - z = 0$, $8y + 6z^2 = 0$, $-2x^2 + 4y - 6z = 0$
D) $x + y - z = 0$, $8y + 6z = 0$, $-2x + 4y - 6z = 0$
3. The value of λ for which the system of equations $3x + y - \lambda z = 0$, $4x - 2y - 3z = 0$, $2\lambda x + 4y + \lambda z = 0$ possess non-trivial solutions is:
- A) -1
B) -9
C) 2
D) 9
4. The eigen values of $\begin{bmatrix} -5 & 2 \\ 2 & -2 \end{bmatrix}$ are:
- A) -1, -6
B) -1, 6
C) 1, -6
D) 1, 6
5. If 2 is an eigen value of $A = \begin{bmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{bmatrix}$ then the eigen values of A^{-1} are:
- A) $\frac{1}{2}, 3, 6$
B) $-\frac{1}{2}, -3, -6$
C) $\frac{1}{2}, \frac{1}{3}, \frac{1}{6}$
D) can not be determined
6. The canonical form of the quadratic form $3x^2 + 22xy + 3y^2$ is:
- A) $8X^2 + 14Y^2$
B) $-8X^2 + 14Y^2$
C) $-8X^2 - 14Y^2$
D) $8X^2 - 14Y^2$

7. The symmetric matrix associated with the quadratic form $-11x_1^2 + 84x_1x_2 + 24x_2^2$ is:
- A) $\begin{bmatrix} -11 & 42 \\ 42 & 24 \end{bmatrix}$ B) $\begin{bmatrix} 11 & -42 \\ -42 & -24 \end{bmatrix}$
 C) $\begin{bmatrix} -11 & 40 \\ 44 & 24 \end{bmatrix}$ D) $\begin{bmatrix} 42 & -11 \\ -11 & 42 \end{bmatrix}$
8. The quadratic form $4x^2 + 12xy + 13y^2 = 16$ is:
- A) Indefinite B) Negative definite
 C) Positive definite D) Positive semidefinite
9. If A is a 3×3 matrix with eigen values 1, -2 and 3, then the determinant of A is:
- A) 2 B) 6
 C) -2 D) -6
10. The value of $\lim_{(x,y) \rightarrow (1,1)} \frac{xy-y-2x+2}{x-1}$ is:
- A) 1 B) -1
 C) 0 D) ∞
11. Consider the function $f(x, y) = \begin{cases} \frac{2xy}{x^2+y^2}, & (x, y) \neq (0,0) \\ 0, & (x, y) = (0,0) \end{cases}$. Then
- A) f is continuous at $(0, 0)$ B) f is not continuous at $(0, 0)$
 C) f is not defined at $(0, 0)$ D) limit does not exist
12. If $f(x, y) = \tan^{-1}\left(\frac{y}{x}\right)$, then $\frac{\partial f}{\partial y}$ is:
- A) $\frac{xy}{x^2+y^2}$ B) $\frac{-y}{x^2+y^2}$
 C) $\frac{y}{x^2+y^2}$ D) $\frac{-xy}{x^2+y^2}$
13. If $\omega = f(s^3 + t^2)$, $f'(x) = e^x$ then $\frac{\partial \omega}{\partial s}$ is:
- A) $s^2 e^{s^3+t^2}$ B) $2te^{s^3+t^2}$
 C) $3te^{s^3+t^2}$ D) $3s^2 e^{s^3+t^2}$
14. If $f(x, y) = xy + \frac{e^y}{y^2+1}$ then $\frac{\partial^2 f}{\partial y \partial x}$ is:
- A) $\frac{e^y}{y^2+1}$ B) xy
 C) 1 D) x

15. If $z = f(x, y)$, $x = g(t)$, $y = h(t)$, $\frac{\partial f}{\partial x}(2, -1) = 3$, $\frac{\partial f}{\partial y}(2, -1) = -2$, $g(0) = 2$,
 $h(0) = -1$, $g'(0) = 5$, $h'(0) = -4$, then $\frac{dz}{dt}$ at $t = 0$ is:
 A) 88 B) 87
 C) 89 D) 90
16. The critical points of the function $f(x, y) = 10xye^{-(x^2+y^2)}$ is:
 A) $(\frac{1}{2}, \frac{1}{2})$ B) $(-\frac{1}{2}, \frac{1}{\sqrt{2}})$
 C) $(-\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}})$ D) $(-\frac{1}{2}, -\frac{1}{2})$
17. The relative minimum point of $f(x, y) = x^3 + y^3 - 12x - 3y + 20$ is:
 A) (2, 1) B) (-2, 1)
 C) (2, -1) D) (-2, -1)
18. The absolute maximum value of $f(x, y) = 2x^2 - 4x + y^2 - 4y + 1$ on the closed triangular plane bounded by the lines $x = 0$, $y = 2$, $y = 2x$ in the first quadrant is:
 A) -1 B) 1
 C) 3 D) -3
19. The value of $\int_0^{\ln 3} \int_0^{\ln 2} e^{x+2y} dy dx$ is:
 A) 1 B) 2
 C) 3 D) 4
20. The value of $\int_0^2 \int_{\frac{y}{2}}^1 e^{x^2} dx dy$ is:
 A) $e - 1$ B) $e + 1$
 C) $-e - 1$ D) $-e + 1$
21. The series $\sum_{k=1}^{\infty} (\frac{-3}{4})^{k-1}$ is:
 A) convergent B) divergent
 C) neither convergent nor divergent D) cannot be determined
22. The series $\sum_{k=1}^{\infty} k^{\frac{-2}{3}}$ is:
 A) convergent B) divergent
 C) neither convergent nor divergent D) cannot be determined

30. The solution of the differential equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} - 2y = 0$ is:
 A) $e^x(C_1 \cos x + C_2 \sin 2x)$ B) $e^x(C_1 \cos x + C_2 \sin x)$
 C) $C_1 e^x + C_2 e^{-2x}$ D) $C_1 e^{-x} + C_2 e^{2x}$
31. The particular integral of $\frac{d^2y}{dx^2} + \frac{dy}{dx} = \cosh 5x$
 A) $\cosh 5x$ B) $\frac{\cosh 5x}{26}$
 C) $\frac{\sinh 5x}{26}$ D) $\sinh 5x$
32. The complementary function of $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 3y = x^2 \ln x$:
 A) $C_1 e^{3x} + C_2 e^{-x}$ B) $C_1 e^{-3x} + C_2 e^x$
 C) $C_1 x^3 + C_2 x^{-1}$ D) $C_1 x^{-3} + C_2 x$
33. The Laplace transform of $f(t) = te^{5t}$ is:
 A) $\frac{1}{(s-5)^2}$ B) $\frac{1}{(s+5)^2}$
 C) $\frac{s}{(s+5)^2}$ D) $\frac{s}{(s-5)^2}$
34. The solution of the initial value problem of $\frac{d^2y}{dx^2} - 6y = 0$, $y(-1) = 4$ is:
 A) $y(t) = -4e^{-6t}$ B) $y(t) = 4e^{6t}$
 C) $y(t) = 4e^{6+6t}$ D) $y(t) = -4e^{-6-6t}$
35. The inverse Laplace transform of $\frac{1}{s^2(s+1)}$:
 A) $1 + t + e^t$ B) $-1 + t + e^{-t}$
 C) $-1 - t - e^{-t}$ D) $-1 - t + e^{-t}$
36. The Laplace transform of $u(t-1)(-t+2)$ is:
 A) $\frac{s-1}{s^2} e^{-s}$ B) $\frac{s-1}{s^2} e^s$
 C) $\frac{s-1}{s} e^{-s}$ D) $\frac{s-1}{s} e^s$
37. The Fourier sine transform of e^{-x} is:
 A) $\sqrt{\frac{2}{\pi}} \frac{1}{1+\omega^2}$ B) $-\sqrt{\frac{2}{\pi}} \frac{1}{1+\omega^2}$
 C) $\sqrt{\frac{2}{\pi}} \frac{\omega}{1+\omega^2}$ D) $-\sqrt{\frac{2}{\pi}} \frac{\omega}{1+\omega^2}$

38. The Fourier cosine integral of $f(x) = \frac{1}{1+x^2}, x > 0$ is:
- A) $\int_0^{\infty} e^{\omega} \cos \omega x \, d\omega$ B) $\int_{-\infty}^{\infty} e^{\omega} \cos \omega x \, d\omega$
 C) $\int_0^{\infty} e^{-\omega} \cos \omega x \, d\omega$ D) $\int_{-\infty}^{\infty} e^{-\omega} \cos \omega x \, d\omega$
39. The Fourier transform of $f(x) = xe^{-x^2}$ is:
- A) $\frac{-i\omega}{2\sqrt{2}} e^{\frac{-\omega^2}{4}}$ B) $\frac{i\omega}{2\sqrt{2}} e^{\frac{-\omega^2}{4}}$
 C) $\frac{-i\omega}{2\sqrt{2}} e^{\frac{\omega^2}{4}}$ D) $\frac{i\omega}{2\sqrt{2}} e^{\frac{\omega^2}{4}}$
40. The inverse Fourier sine transform of $\frac{\omega}{4+\omega^2}$ is:
- A) e^{4x} B) e^{-4x}
 C) e^{2x} D) e^{-2x}
41. A mass of 10 kg is initially at rest. A force of 50 N is applied to it for 20 seconds. What is the velocity at the end of 20 s.?
- A) 10 m/s B) 100 m/s
 C) 4 m/s D) 40 m/s
42. Two balls of the same mass and made of perfectly elastic material are initially at rest. One of the balls moves with a velocity v and hits the second ball. After collision both the balls move together with a velocity:
- A) v B) $v/2$
 C) $v/4$ D) $v/8$
43. Impulse is:
- A) Force \times time B) Force/time
 C) Force \times time² D) Force/time²
44. A block of mass m is placed on a smooth inclined plane of inclination θ with the horizontal. The force exerted by the plane on the block has a magnitude:
- A) $mg \tan \theta$ B) mg
 C) $mg \cos \theta$ D) $mg/\cos \theta$
45. The force required to keep the object moving from rest is a measure of:
- A) Sliding friction B) Rolling friction
 C) Static friction D) None of the above

54. In the case of resonance in forced oscillations:
- A) Amplitude is infinity
 - B) Driving frequency is equal to natural frequency
 - C) Amplitude is zero
 - D) None of the above
55. When two waves of same amplitude add constructively, the intensity becomes:
- A) Double
 - B) Four times
 - C) Eight times
 - D) Half
56. In an interference pattern, the zero order fringe can be identified using _____ light.
- A) White
 - B) Yellow
 - C) Green
 - D) Monochromatic
57. The essential condition for diffraction of light to occur is that the size of the aperture:
- A) Must be very small when compared to the wavelength of light
 - B) Must be very large when compared to the wavelength of light
 - C) Must be comparable to the wavelength of light
 - D) Has no influence on diffraction
58. A diffraction pattern is obtained using a beam of red light. What will happen to the diffraction pattern if red light is replaced by blue light?
- A) Bands will become narrower and crowd together
 - B) Bands will become broader and move further apart
 - C) No change will take place
 - D) Bands will disappear
59. An electron and proton have the same De Broglie wavelength. Then the kinetic energy of the electron is:
- A) Zero
 - B) Infinity
 - C) Equal to the kinetic energy of the proton
 - D) Greater than the kinetic energy of the proton
60. Which other variable pairs (other than momentum and position) are important observables in Heisenberg's uncertainty principle?
- A) Energy and momentum
 - B) Energy and time
 - C) Time and position
 - D) Momentum and velocity

70. Which among the following is described by the concept of numerical in an optical fibre?
- A) Light collection
B) Light scattering
C) Light dispersion
D) Light polarization
71. Electrolyte used in calomel electrode is:
- A) NaCl solution
B) KCl solution
C) MgCl₂ solution
D) CaCl₂ solution
72. Which among the following can displace hydrogen from both acid and base?
- A) Zinc
B) Iron
C) Aluminium
D) Nickel
73. The number of vibrational modes possible in CO₂ molecule is:
- A) 1
B) 2
C) 3
D) 4
74. Which property of electrolysis copper plating makes it particularly useful in printed circuit board manufacturing?
- A) It can deposit copper only on conductive surface
B) It can deposit copper on non-conductive surface
C) It requires strong electric field
D) It requires strong magnetic field
75. The standard EMF (E_{cell}^0) of the cell represented as Cu/Cu²⁺// Ag⁺/Ag is:
Given that $E_{Cu^{2+}/Cu}^0 = 0.34 V$ and $E_{Ag^+/Ag}^0 = 0.80 V$.
- A) 1.14 V
B) -1.14 V
C) 0.46 V
D) -0.46 V
76. Which of the following compounds give single signal in NMR spectroscopy?
- A) Methane
B) Benzene
C) 1, 2 - Dichloroethane
D) All of these
77. If the center of mass changes position with time, the molecule has _____ energy.
- A) Electronic
B) Vibrational
C) Rotational
D) Translational
78. For a vibrational transition, the radiation absorbed is:
- A) Infrared
B) Ultraviolet
C) Radiowave
D) Microwave

79. The UV/Visible spectrum is a plot of absorbance (on the y-axis) against _____ (on the x-axis):
- A) Wavelength
B) Frequency
C) Wave number
D) Transmittance
80. In chromatography, the stationary phase can be:
- A) Solid or liquid
B) Solid or gas
C) Liquid or gas
D) Solid, liquid or gas
81. Identify the statement related to chromatography which is **not** correct:
- A) Chromatography is used for analytical separation
B) Chromatography can be used for quantitative analysis
C) Solid or liquid can act as mobile phase
D) Chromatography can be used for the identification of compounds
82. Nanotube is an example of a _____ nanomaterial.
- A) zero dimensional
B) one dimensional
C) two dimensional
D) three dimensional
83. The range of nanoscale is approximately:
- A) 1-100 nm
B) 100-200 nm
C) 200-300 nm
D) 300-400 nm
84. Thermal stability of a sample can be studied by:
- A) GC
B) TGA
C) HPLC
D) SEM
85. Which of the following molecule is optically active?
- A) Ethanol
B) Propanol
C) 1- Butanol
D) 2-Butanol
86. Identify the chain isomer from the following molecular pairs:
- A) Ethanol and diethyl ether
B) Butane and 2-methyl propane
C) 1-chloropropane and 2-chloropropane
D) None of these
87. Which is the most stable conformer of cyclohexane?
- A) Boat form
B) Chair form
C) Twist boat form
D) Half chair form

88. Temporary hardness of water is due to the presence of:
 A) CaSO_4 B) Ca(OH)_2
 C) $\text{Ca(HCO}_3)_2$ D) CaCl_2
89. Identify the **incorrect** statement among the following:
 A) Carbonate hardness can be removed by boiling
 B) Hard water form white scum with soap
 C) Hardwater improves the cleansing quality of soap
 D) Due to the presence of hardness producing salts, the boiling point of water is increased
90. Which among the following affects the dissolved oxygen level of water?
 A) Temperature B) Pressure
 C) BOD D) All of these
91. Which of the following is **not** an operating system?
 A) macOS B) Linux
 C) Windows D) Oracle
92. Identify the true statement/s:
 Statement 1 : Output of a compiler is machine code
 Statement 2 : Interpreter is a system software
 A) 1 only B) 2 only
 C) Both 1 & 2 D) Neither 1 nor 2
93. What is the output of the following program?

```
#include <stdio.h>

int main() {
    int a=0, b=1;
    if (0)
        printf("1");
    else
        printf("0");
    return 0;
}
```

 A) 1 B) 0
 C) 10 D) Error
94. Which of the following is a keyword in C language?
 A) goto B) signed
 C) enum D) All of these

95. What is the output of the following program?

```
#include <stdio.h>

int main() {
    int i;
    for(i=1;i<10;i++);
    printf("%d", i);
    return 0;
}
```

- A) 10
B) 11
C) 12
D) Error

96. Bubble sort can be used to:

- A) Sort the elements in ascending order
B) Sort the elements in descending order
C) Both (A) and (B)
D) Search the elements in ascending and descending order

97. strcpy() is used to:

- A) Find the length of a string
B) Reverse the given string
C) Concatenate two strings
D) None of the above

98. Formal and actual parameters in a function:

- A) Should be same name
B) Should be a string
C) Both (A) and (B)
D) None of the above

99. What is the output of the following program?

```
#include <stdio.h>
#include <string.h>
int main() {
    char str1[] = "11";
    char str2[] = "00";
    strcat(str1, str2);
    printf("%s", str1);
    return 0;
}
```

- A) 1100
B) 0011
C) 1010
D) None of these

100. Maximum size of array in C language depends on:

- A) Data type size
B) Memory
C) Both (A) and (B)
D) None of these

101. What is the output of the following program?

```
#include <stdio.h>

int main() {
    int matrix[3][3] = {
        {1, 2, 3},
        {4, 5, 6},
        {7, 8, 9}
    };
    int i, s=0;
    for (i = 0; i < 3; i++)
        s += matrix[i][i];
    printf(" %d", s);
}
```

A) 15

B) 6

C) 12

D) 18

102. Which of the following is a pointer declaration variable in C language?

A) *

B) &

C) Both (A) and (B)

D) None of these

103. Null pointer in C language:

A) Pointer with zero value

B) Pointer with infinite value

C) Pointer with negative value

D) Pointer with integer and floating-point values

104. What is the output of the following program?

```
#include <stdio.h>

int p = 10;
int *p;
p = &p;
printf("%d", *p);
}
```

A) 10

B) 11

C) Error

D) 12

105. What is the output of the following C Program?

```
#include <stdio.h>

void main()
{
int a = 50, *p = &a;
printf("%d", *p+10);
}
```

- A) 60
B) 51
C) Error
D) None of these

Questions (106-110). Read the sentences given and choose the most appropriate of the options provided to answer the questions/fill in the blanks:

For reasons big and small, exercise is a miracle drug. I am such a believer that it's the key to health, wellness, and longevity that I prescribe it to every patient I see.

106. The speaker/writer is a:

- A) surgeon
B) sportsman
C) physician
D) coach

107. According to the speaker/writer, exercise is _____ medicine.

- A) like
B) the equivalent of
C) equal to
D) (no words required to fill the blank)

108. The words 'every patient I see' refers to Every person:

- A) the speaker/writer looks at
B) who meets the speaker/writer
C) who consults the speaker/writer for treatment
D) who sees the speaker/writer

109. 'Longevity' refers to:

- A) Location
B) Length
C) Life span
D) Health

110. A word formed from 'prescribe':

- A) Describe
B) Proscriptive
C) Description
D) Prescriptive

Questions (111-115). Choose the most appropriate of the options provided to answer the questions:

111. Let's _____ a drink.
A) strike
B) can
C) have
D) slake
112. I told the protesters to _____ away.
A) leave
B) go
C) free
D) exit
113. The nurse suggested that the wound _____ become infected.
A) did have
B) could have
C) will have
D) shall have
114. In response to the question, "Are you going out this evening?"
A) "No, never."
B) "No, not now."
C) "Yes, before breakfast."
D) "Yes, after dinner."
115. In response to the statement, "I'm not sure why you're here at this time."
A) "I'm sorry, but your secretary said I could meet you now."
B) "Neither am I."
C) "I was just passing by."
D) "It's never too late to change."
116. Pick the sentence that contains an **error**:
A) Left to me, I'd promote them all.
B) Never have I seen a lovelier sunset.
C) Seven times seven is forty-nine.
D) The manager is an old greedy man.
117. In the sentence, "I hope you can work out your issues" the phrase 'work out' means to:
A) exercise
B) resolve
C) extricate
D) absolve
118. Pick the correctly spelt word:
A) mnemonic
B) memorium
C) momento
D) mindsett
119. Pick the part of the sentence that contains an error, or pick 'D' to denote that there is no error in it:
The building was damaged in the explosion. (No error)
A) B) C) D)
120. She likes fish while I _____ vegetables.
A) eat
B) have
C) prefer
D) (No word required to fill in the blank)