Bsc statistics

(Pages : 3) **T – 2288**

Reg. No. : .....

Name : .....

Fourth Semester B.A./B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Language Course – English

EN 1411.1/EN 1411.3 : READINGS IN LITERATURE

(Common for CBCSS B.A./B.Sc. & Career Related 2(a) Courses)

(2019 Admission Onwards)

Time : 3 Hours Max. Marks : 80

I. Answer **all** questions, each in **a word** or **sentence**.

1. What is the question the poet asks the labourers of England?
2. List the main themes of "The Gift Outright".
3. What is the central theme of "Telephone Conversation"?
4. What is the meaning of the word 'interior' in Atwood's poem?
5. What does the sound of the flute signify in "House of a Thousand Doors"?
6. Why is the colour yellow associated with the Indian bride?
7. Theme of "The Exercise Book".
8. How did the narrator understand that his liver was out of order?
9. What does "You are Under Surveillance" talk about?
10. Who was Kochuraman in "The Power of Faith"?

(10 × 1 = 10 Marks)

P.T.O.

II. Answer any **eight**, each in a short paragraph not exceeding **50** words.

11. What are the things the poor labourers do not get although they work very hard?

12. What helped Frost establish his reputation as a truly national poet?

13. The protagonists of "Telephone Conversation".

14. What does 'The House of a Thousand Doors' symbolize?

15. Comment on card in the poem "Identity Card".

16. What did the white men do to the aboriginals according to Oodgeroo Noonuccal?

17. What does "Agony" depict?

18. The sad fate of Uma in "The Exercise Book".

19. The attitude of Krishnan's daughter to her grandmother.

20. The character of Lomov.

21. What effect did John Kurian's notice about the surveillance camera have on his daughter Sini?

22. What is Arundhati Roy's first comment on nuclear weapons?

(8 × 2 = 16 Marks)

III. Answer any **six**, each in a paragraph not exceeding **100** words.

23. What does Frost's "The Gift Outright" convey?

24. Write a note on the aesthetics of "I cannot help blossoming".

25. How does Atwood describe her journey to the interior?

26. How does the poem "We are Going" end?

27. Why did Krishnan refuse to help his sister when she was ill?

28. The disease of the protagonist in "The Man Who was a Hospital".

29. What was peculiar in the character of Natalya Stepanovna?

30. What does Malcolm X say about Marcus Garvey?

31. What is Arundhati Roy's opinion about the common people of India?

(6 × 4 = 24 Marks)

IV. Answer any **two**, each in about **300** words.

32. What is Shelley's exhortation to the men of England?

33. "The Exercise Book" as the story of the sad predicament of the Indian girl child.

34. Chekhov's use of humour and exaggeration in "A Marriage Proposal'.

35. What does Arundhati Roy say about India's last nuclear test?

(2 × 15 = 30 Marks)

(Pages : 4) **T – 2588**

Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Mathematics

Complementary Course for Statistics

MM 1431.4 : MATHEMATICS IV – LINEAR ALGEBRA

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the first **ten** questions are compulsory. They carry **1** mark each.

1. Consider $V = \{(\alpha, \beta, \gamma) / \alpha, \beta, \gamma \in R\}$. Define $(\alpha, \beta, \gamma) + (\alpha', \beta', \gamma') = (\alpha + \alpha', \beta + \beta', \gamma + \gamma')$ and $\lambda(\alpha, \beta, \gamma) = (\lambda a, \lambda\beta, 0)$ for all $\alpha, \beta, \gamma, \alpha', \beta', \gamma', \lambda \in R$. V is not a vector space why?
2. Define basis for a Vector space.
3. Let V be the set of all polynomials of degree $\leq n$ in $R[x]$. What is the dimension of the vector space V.
4. Find the orthonormal basis for the orthogonal basis (1, 0, 1).
5. When a matrix is said to be in row reduced echelon form?
6. Write the augmented matrix for the following system of equations
   $x + y + z = 6;\ x - y + 2z = 5;\ 3x + y + z = 8$.
7. Find the eigen values of the matrix $A = \begin{pmatrix} 1 & -2 \\ -5 & 4 \end{pmatrix}$.

P.T.O.

8. When do we say that a matrix is non-diagonalizable?

9. Obtain the matrix for the linear transformation $T : V_2(R) \to V_2(R)$ given by $T(a, b) = (-b, a)$ with respect to the standard basis $\{(1, 0), (0, 1)\}$.

10. Find the distance between the vectors $(2, 1, 4)$ and $(1, 0, -1)$.

(10 × 1 = 10 Marks)

SECTION – II

Answer any **eight** questions. These questions carry **2** marks.

11. Verify the vectors $u = (1, 2, 3)$ and $v = (0, -2, 1)$ are orthogonal.

12. Is Q is a vector space over R? If not why? And give one example.

13. Find $L(S)$, if $S = \left\{\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}, \begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}\right\}$ in $M_2(R)$.

14. Show that (3, 7) does not belongs to the linear span of the set {(1, 2), (2, 4)}.

15. Define contraction and dilation from R^2 to R^2.

16. Let $W = \{f / f \in F[x]$ and $f(a) = 0\}$. Prove that W is a subspace of $F[x]$.

17. Let $T : R^3 \to R^3$ be a transformation that reflects each vector $x = (x_1, x_2, x_3)$ through the plane $x_3 = 0$ onto $T(x) = (x_1, x_2, x_3)$. Show that T is a linear transformation.

18. Find the quadratic form of the symmetric matrix $\begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$.

19. Find the rank of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 2 & 5 & -4 \end{pmatrix}$ by row reduced echelon form.

20. Let f_1 and f_2 are the two linear functional on a vector space V over a set of real numbers defined as $f_1(a, b) = a + 2b$ and $f_2(a, b) = 3a - b$ for all $a, b \in R$, Find $(f_1 - f_2)(a, b)$.

21. If the set $\{\alpha_1, \alpha_2, ..., \alpha_n\}$ is a linearly independent set and if $a_1, a_2, ..., a_n$ and $b_1, b_2, ..., b_n \in F$ such that $\sum \alpha_i \alpha_i = \sum b_i \alpha_i$. Prove that $a_i = b_i$ for all $i = 1, 2, ..., n$.

22. Find the linear transformation $T : V_2(R) \to V_3(R)$ given by the matrix $\begin{pmatrix} 2 & 1 & -1 \\ 1 & 1 & -1 \end{pmatrix}$ with respect to the standard basis.

(8 × 2 = 16 Marks)

SECTION – III

Answer any **six** questions. These questions carry **4** marks each.

23. Prove that (a) $\|x\| \geq 0$ and $\|x\| = 0$ iff $x = 0$ (b) $\|\alpha x\| = |\alpha| \, \|x\|$.

24. Verify the set of vectors (1, 3, 2), (1, –7, -8) and (2, 1, –1) are linearly independent.

25. Find a basis for the vector space $M_2(R)$ of all 2×2 matrices whose elements are real numbers.

26. Find *a, b* if rank of the following matrix *A* is 2.

$$A = \begin{pmatrix} 0 & 1 & -3 & -1 \\ 1 & 0 & 1 & 1 \\ 3 & 1 & a & b \\ 1 & 1 & -2 & a \end{pmatrix}$$

27. Verify the quadratic form $Q(x) = 3x_1^2 + 2x_2^2 + x_3^2 + 4x_1x_2 + 4x_2x_3$ is positive definite.

28. Show that the eigen values of a diagonal matrix are the same as its diagonal elements.

29. Diagonalize the following matrix, if possible.

$$A = \begin{pmatrix} 2 & 4 & 3 \\ -4 & -6 & -3 \\ 3 & 3 & 1 \end{pmatrix}$$

30. Let $T : R_2 \to R_3$ be the transformation that maps a polynomial $p(t)$ into the polynomial $(t+5)p(t)$.

(a) Find the image of $p(t) = 2 - t + t^2$.

(b) Show that T is a linear transformation.

(c) Find the matrix for T relative to the bases $\{1, t, t^2\}$ and $\{1, t, t^2, t^3\}$.

31. Given $u \neq 0$ in R^n. Let $L = \text{Span}[u]$. Show that the mapping $x \to \text{proj}_t, x$ is a linear transformation.

(6 × 4 = 24 Marks)

SECTION – IV

Answer any **two** questions. These questions carry **15** marks each.

32. Apply Gram-Schmidt orthogonalization process to construct an orthonormal basis for $V_3(R)$ with the standard dot(inner) product for the basis $\{v_1, v_2, v_3\}$, where $v_1 = (1, 0, 1)$, $v_2 = (1, 3, 1)$ and $v_3 = (3, 2, 1)$.

33. (a) Show that $W = \left\{ \begin{pmatrix} a & 0 \\ 0 & b \end{pmatrix} / a, b \in R \right\}$ is a sub space of $M_2(R)$. **6**

(b) Show that the set $S = \{(1, 0, 0), (0, 1, 0), (0, 0, 1)\}$ is a basis in $V_3(R)$. **6**

(c) Find the inner product and lengths of (1, 2, 3) and (0, –2, 1). **3**

34. Investigate for what values of a and b the system of equations.

$x + y + 2z = 2$

$2x - y + 3z = 10$

$5x - y + az = b$

have, (a) no solution (b) unique solution (c) an infinite number of solutions.

35. Diagonalize the real symmetric matrix $A = \begin{pmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3 \end{pmatrix}$.

(2 × 15 = 30 Marks)

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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Physics

Complementary Course for Statistics

PY 1431.3 – MODERN PHYSICS AND ELECTRONICS

(2018 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

Very short answer type. Answer **all** the questions. (**One** word to a maximum of **two** sentences). Each question carries **1** mark.

1. Define Bohr electron magneton.
2. Define the term mass defect.
3. What are the basic characteristics of nuclear forces?
4. Explain Planck's quantum hypothesis.
5. Write the Schrodinger time independent wave equation for the particle inside the box.
6. What is the significance of the knee voltage
7. What are the basic features of an amplifier?
8. NAND gate as universal gate. Explain.
9. Write the truth table of the XOR gate.
10. Convert decimal number 10 in to binary, octal and hexa decimal number.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Short Answer. Answer any **eight** questions. Answers should not exceed **one** paragraph. Each question carries **2** marks.

11. State and explain Pauli's exclusion principle.

12. Explain L–S and j–j coupling schemes.

13. Briefly explain the general properties of nucleus.

14. What do you understand by secular and transient equilibrium?

15. Why classical theory failed to explain the stability of the atom?

16. What are the basic postulates of wave mechanics?

17. What are the basic properties of the wave function?

18. What is meant by a normalised wave function?

19. What is a zener diode? How does a zener diode maintain a constant voltage across it?

20. State duality principle in logic gates.

21. Explain the inverter gate with suitable diagram.

22. Explain De-morgan's theorem.

(8 × 2 = 16 Marks)

SECTION – C

Short Essay. Answer any **six** questions. Each question carries **4** marks. (Not to exceed **120** words)

23. Calculate (a) the wavenumber, (b) the wavelength and (c) the frequency of the H_α line of Hydrogen, assuming that the nucleus has infinite mass. Find the wavelength of the Balmer series limit.

24. Given the following isotope masses: ${}_3Li^7$ = 7.016004, ${}_3Li^6$ = 6.015125 and ${}_0n^1$ = 1.008665 u. Calculate the B.E. of a neutron in the ${}_3Li^7$ nucleus. Express the result in u, MeV and joules.

25. Calculate the permitted energy levels of an electron, in a box 1Å wide.

26. Derive the time-dependent form of Schrodinger's equation

27. A transistor has $\beta = 150$. Calculate the approximate collector and base currents. If the emitter current is 10 mA.

28. In a transistor CE amplifier $V_{cc} = 20v$ $R_1 = 15k\ \Omega$, $R_2 = 5\ k\ \Omega$ $R_c = 2k\ \Omega$, $R_E = 3\ k\ \Omega$. Draw the dc load lines. And mark the Q-point . Assume silicon transistor.

29. Convert (a) decimal number 755 to hexa decimal equivalent (b) hexa decimal number AB0 into decimal equivalent.

30. Discuss about gates. Explain in detail circuit, truth table, operation of three basic logic gates

31. With a suitable diagram discuss verious theorems of Boolean algebra.

(6 × 4 = 24 Marks)

SECTION – D

Long Essay. Answer any **two** questions. **Each** question carries **15** marks.

32. Describe the vector model of the atom and explain the different quantum numbers associated with it.

33. State the law of radioactive decay, derive an expression for it. Calculate the decay constant of radium given its half-period as 1590 years.

34. Calculate the values of the energy of a particle in a one dimensional box. Indicate graphically the first three wave functions for such a particle.

35. Explain the construction and workings of a full wave rectifier. Calculate its ripple factor and efficiency.

(2 × 15 = 30 Marks)

(Pages : 3) **T – 2295**

Reg. No. : .....

Name : .....

Fourth Semester B.A./B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Language Course : Additional Language – Hindi

HN 1411.1 – HINDI : KAVITA EVAM EKANKI

(2020 Admission onwards)

Time : 3 Hours Max. Marks : 80

I. एक या दो वाक्यों में उत्तर लिखिए –

1. 'भाषा की मिठास' नामक कविता के रचयिता कौन हैं?
2. छायावाद के सुकुमार कवि कौन हैं?
3. 'बीजक' के कितने भाग हैं?
4. महादेव और बलदेव किस एकांकी के पात्र हैं?
5. सूरदास की अक्षयकीर्ति का आधार कौन सी रचना हैं?
6. चकोरी की माँ का नाम क्या है?
7. 'रामचरितमानस' के रचयिता कौन हैं?
8. 'भिक्षुक' की रचना किन्होंने की थी?
9. 'छोटी मछली बड़ी मछली' नामक एकांकी के रचयिता कौन हैं?
10. 'बबूल के नीचे सोता बच्चा' किस कवि की कविता है?

(10 × 1 = 10 Marks)

P.T.O.

II. किन्हीं आठ प्रश्नों के लघु उत्तर करीब 50 शब्दों में लिखिए।

11. 'दस मिनट' नामक एकांकी का सन्देश व्यक्त करें।

12. कात्यायनी के मत में औरत के सामने घर कैसा था?

13. हिन्दी साहित्य में ममता कालिया का स्थान क्या है?

14. 'भाषा की मिठास' नामक कविता में व्यक्त विचार क्या है?

15. स्वदेश दीपक के साहित्यिक अवदान क्या-क्या हैं?

16. एक प्रतीकात्मक कविता है 'टूटा पहिया' – स्पष्ट करें।

17. रामकुमार वर्मा का परिचय दें।

18. रहीम के चार ग्रंथों के नाम लिखिए।

19. डॉ. कौशिक कौन है?

20. पंत की 'नौका विहार' नामक कविता में की गई प्राकृतिक वर्णना का परिचय दें।

21. अनामिका ने 'नमक' नामक कविता में कौन सा सन्देश व्यक्त किया है?

22. 'छोटी मछली बड़ी मछली' में प्रयुक्त व्यंग्य पर प्रकाश डालिए।

(8 × 2 = 16 Marks)

III. किन्हीं छः प्रश्नों के उत्तर करीब 120 शब्दों में लिखिए।

23. 'बबूल के नीचे सोता बच्चे' में कवि क्या सन्देश देना चाहते हैं?

24. 'चरण-कमल बंदौ हरि राई।
जाकि कृपा पंगु गिरी लघे, अंधे को सब कुछ दरसाई।।
बहिरौ सुनै मूक पुनि बोलै, रंग चलै सिर छत्र धराई।
सूरदास स्वामी करुणामय, बार-बार बंदौ तेहि पाई।।' – व्याख्या कीजिए।

25. उदयप्रकाश की साहित्यिक सेवाओं पर प्रकाश डालिए।

26. 'भरोसा' नामक कविता में व्यक्त विचार पर प्रकाश डालिए।

27. 'रहीम के दोहे आदर्श और नीति के वाहक हैं' - इस कथन का समर्थन कीजिए।

28. 'भिक्षुक' कविता की प्रासंगिकता क्या है?

29. 'दया धर्म का मूल है, पाप मूल अभिमान।
तुलसी दया न छोड़िए जब लोग घाट में प्राण।।' - सप्रसंग व्याख्या कीजिए।

30. कवयित्री अनामिका का परिचय दें।

31. कवि धर्मवीर भारती अपनी 'टूटा पहिया' नामक कविता के माध्यम से क्या सन्देश देना चाहते हैं?

(6 × 4 = 24 Marks)

IV. किन्हीं दो प्रश्नों के उत्तर करीब 250 शब्दों में लिखिए।

32. 'छोटी मछली बड़ी मछली' नामक एकांकी में एकांकीकार कौनसा सन्देश देना चाहते हैं? आलोचना कीजिए।

33. 'कबीरदास हिन्दी साहित्य के महान कवि ही नहीं बल्कि बड़े समाज सुधारक भी थे' - प्रस्तुत कथन की आलोचना कीजिए।

34. 'शादी की बात' नामक एकांकी का सारांश लिखकर उद्देश्य व्यक्त करें।

35. 'पिता' नामक कविता का सारांश लिखकर उसकी समीक्षा कीजिए।

(2 × 15 = 30 Marks)

(Pages : 4) **T – 2292**

Reg. No. : .....

Name : .....

Fourth Semester B.A./B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Language Course – Additional Language – Malayalam

ML 1411.1 : ദൃശ്യകലാസാഹിത്യം

(2021 Admission Onwards)

Time : 3 Hours Max. Marks : 80

I. ഒരു വാക്കിലോ വാക്യത്തിലോ ഉത്തരമെഴുതുക.

1. കോട്ടയംകൃതികൾ എന്നറിയപ്പെടുന്ന ആട്ടക്കഥളേതൊക്കെ ?

2. നിവാതകവചകാലകേയവധം ആരുടെ കൃതിയാണ് ?

3. കല്ല്യാണസൗഗന്ധികം ഏത് തുള്ളൽ വിഭാഗത്തിൽപ്പെടുന്നു ?

4. 'കാന്താരതാരകം' ഏതു കൃതിയുടെ വ്യാഖ്യാനമാണ് ? ഗ്രന്ഥകർത്താവ് ആര് ?

5. പറയൻ തുള്ളൽ വിഭാഗത്തിൽ ഉൾപ്പെടുന്ന കൃതിയേത് ?

6. സദാരാമ എഴുതിയതാര് ? സാഹിത്യചരിത്രത്തിലുള്ള പ്രാധാന്യമെന്ത് ?

7. മലയാളത്തിലെ ആദ്യ സാമൂഹികപരിഷ്കരണ നാടകം.

P.T.O.

8. തനതുനാടകങ്ങൾ ഏതെല്ലാം ?

9. മലയാളത്തിലെ ആദ്യ ശബ്ദചിത്രം ഏത് ?

10. 'മഴ' എന്ന സിനിമ ഏതു കൃതിയെ അടിസ്ഥാനമാക്കിയാണ് ആവിഷ്കരിച്ചിട്ടുള്ളത് ?

(10 × 1 = 10 Marks)

II. **അമ്പതു** വാക്കിൽ കവിയാതെ **എട്ടു** ചോദ്യത്തിന് ഉത്തരമെഴുതുക.

11. കഥകളിയുമായി ബന്ധപ്പെട്ട ചടങ്ങുകൾ പരിചയപ്പെടുത്തുക.

12. 'വിഫലാനി വോ വരഫലാനി കാനി'? ആര്, ആരോട് ചോദിക്കുന്നതാണ് ? സന്ദർഭം വ്യക്തമാക്കുക.

13. 'എലിയെപ്പോലെയിരിക്കുന്നവനൊരു

പുലിയെപ്പോലെ വരുന്നതു കാണാം'

- ആരെക്കുറിച്ചാണ് സൂചിപ്പിക്കുന്നത് ? സന്ദർഭം വിശദമാക്കുക.

14. ആദ്യകാല നാടക പരിഭാഷകളെ പരിചയപ്പെടുത്തുക.

15. ലെനിൽ രാജേന്ദ്രന്റെ സിനിമകളേതെല്ലാം?

16. ഓട്ടൻതുള്ളൽ - കുറിപ്പെഴുതുക.

17. അനുവർത്തനം എന്നാലെന്ത്?

18. സംഗീതനാടകങ്ങളുടെ സവിശേഷതകൾ എന്തെല്ലാം?

19. ആട്ടക്കഥാസാഹിത്യം - കുറിപ്പെഴുതുക.

20. തനതു നാടകവേദിയെ പരിചയപ്പെടുത്തുക.

21. തിരക്കഥ എന്നാലെന്ത്?

22. സിനിമ എന്ന കലാരൂപത്തിന്റെ വ്യതിരിക്തതകൾ എന്തെല്ലാം?

(8 × 2 = 16 Marks)

III. **നൂറു** വാക്കിൽ കവിയാതെ **ആറു** ചോദ്യത്തിന് ഉത്തരമെഴുതുക.

23. "യുദ്ധം ചെയ്യു തളർച്ച വരുമ്പോൾ

ബുദ്ധിയിൽ നല്ല വിവേകവുമുണ്ടാം"

- സന്ദർഭം വിശദീകരിക്കുക.

24. 'നയവും ജയവും ഭയവും വ്യയവും

നാടുഭരിപ്പവരോടു നടപ്പതു' ആശയം വ്യക്തമാക്കുക.

25. ആട്ടക്കഥയും നാടകവും ദൃശ്യകലയെന്ന നിലയിൽ വ്യത്യാസപ്പെട്ടിരിക്കുന്നതെങ്ങനെ?

26. മഴ സിനിമയുടെ ദൃശ്യവൽക്കരണത്തെക്കുറിച്ച് വിവരിക്കുക.

27. സ്വപ്നവാസവദത്തം പരിഭാഷകളിൽ നിന്നും പന്മന രാമചന്ദ്രൻ നായരുടെ പരിഭാഷ വ്യതിരിക്തമാകുന്നുണ്ടോ? വിശദീകരിക്കുക.

28. അടുക്കള സ്ത്രീപക്ഷ നാടകമാകുന്നതെങ്ങനെ? സാധൂകരിക്കുക.

29. നളചരിതത്തിലെ ഭാഷാപരമായ സവിശേഷതകളെന്തെല്ലാം?

30. കിരാതം ഓട്ടൻതുള്ളലിന്റെ ഭാഷാസവിശേഷതകളെ ക്രോഡീകരിക്കുക.

31. നളചരിതം മൂന്നാം ദിവസത്തിലെ നളന്റെ ചിന്തകൾ തത്ത്വചിന്താപരമാണ്. പരിശോധിക്കുക.

(6 × 4 = 24 Marks)

IV. **മുന്നൂറു** വാക്കിൽ കവിയാതെ **രണ്ട്** ചോദ്യത്തിന് ഉത്തരമെഴുതുക.

32. ഉണ്ണായിവാര്യരുടെ നളചരിതം ആട്ടക്കഥയുടെ സവിശേഷത വ്യക്തമാക്കുക.

33. കേരളീയമായ സാമൂഹ്യപശ്ചാത്തലം കുഞ്ചൻ നമ്പ്യാരുടെ കൃതികളിൽ അനാവരണം ചെയ്യപ്പെടുന്നുണ്ടോ? പരിശോധിക്കുക.

34. മലയാളത്തിലുണ്ടായിട്ടുള്ള അനുവർത്തന സിനിമകൾ മലയാളസിനിമയുടെ ചരിത്രത്തെ സ്വാധീനിച്ചതെങ്ങനെ?

35. കേരളത്തിന്റെ ദൃശ്യകലാപാരമ്പര്യത്തെ സാമാന്യമായി പരിചയപ്പെടുത്തുക.

(2 × 15 = 30 Marks)

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Reg. No. : .....

Name : .....

Fourth Semester B.Sc. Degree Examination, July 2024

First Degree Programme under CBCSS

Statistics

Core Course

ST 1441 : PROBABILITY AND DISTRIBUTION II

(2022 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. Each question carries **1** mark.

1. Write the pdf of a degenerate random variable.
2. Define a discrete uniform distribution.
3. Identify the distribution with MGF $\left(\frac{1}{3}+\frac{2}{3}e^{t}\right)$.
4. Give a characterization property of the Geometric distribution.
5. What is the relationship between mean, variance and third central moment of a Poisson distribution?
6. Can a Binomial distribution have mean 3 and variance 4? Establish your claim.
7. Define the Multinomial distribution.
8. Give an example of a random variable whose moment generating function does not exist.
9. Write the pdf of a triangular distribution in (0, 2).
10. Define a bivariate normal density and identify the parameters.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

Answer any **eight** questions. Each question carries **2** marks.

11. Find the mean and variance of a discrete uniform random variable.
12. Derive the probability generating function of a Negative Binomial distribution.
13. A coin is tossed with a probability p to get a head in a single trial. If X denotes the number of trials required to get a head, what is the distribution of X?
14. Write the conditions under which a hypergeometric distribution tends to Binomial.
15. Find the characteristics function of an exponential distribution with parameter θ.
16. Identify the Gamma distribution with shape parameter unity.
17. State the additive property of a Gamma distribution.
18. If X~Beta (p, q) Type-II distribution, what is the distribution of $\frac{1}{X}$?
19. Write the pdf of a double exponential (Laplace) distribution.
20. Give at least four applications of the Normal distribution.
21. For a normal distribution $N(\mu, \sigma^2)$, write the expressions for the central moments.
22. Define a multivariate normal distribution.

(8 × 2 = 16 Marks)

SECTION – C

Answer any **six** questions. Each question carries **4** marks.

23. Write the distribution function of a discrete Uniform (Rectangular) distribution and also establish its mean and variance.
24. If X and Y are independent Geometric random variables, then show that $P(X = s / X + Y = s) = P(X = s - 1 / X + Y = s) = \frac{1}{s+1}$.
25. Mention the important properties of a Binomial distribution.
26. Obtain the expression for the coefficient of variation of a Poisson distribution.
27. If X and Y are independent U(0,1), what is the distribution of X+Y?

28. Let X_1, X_2 be a random sample of size two from a log-normal population with parameters μ and σ^2. What is the distribution of $\sum_{i=1}^{2}\left(\frac{\log X_i - \mu}{\sigma}\right)^2$?

29. What is the relation between Q.D and S.D of a Normal distribution?

30. State and prove the reproductive property of the Gamma distribution.

31. Define the joint central moments (first four) for a bivariate distribution.

(6 × 4 = 24 Marks)

SECTION – D

Answer *any* **two** questions. Each question carries **15** marks.

32. (a) If the random variable X has a Binomial distribution with parameters $n = 8$ and $p = 1/4$, find (i) $P(X = 0)$, (ii) $P(X \leq 1)$, (iii) $P(X > 7)$.

    (b) If X is a Poisson Random variable such that $P(X = 1) = P(X = 2)$, the find $P(X = 4)$.

33. (a) Discuss the Hyper geometric distribution. Establish its mean and variance.

    (b) Establish the probability generating function of a Geometric random variable.

34. (a) Find the moment generating function of an exponential distribution and hence find its mean and variance.

    (b) Let X_1 follows Gamma (θ, α_1) and X_2 follows Gamma (θ, α_2) and are independent. Find the distribution of X_1 given $X_1 + X_2$.

35. (a) Establish the relationship between Q.D, M.D and S.D for a Normal distribution.

    (b) If $(X, Y) \sim BVN(\mu_1, \mu_2, \sigma_1, \sigma_2, \rho)$, find the distribution of X/Y. Hence deduce that $V(X) \geq V(X/Y)$.

(2 × 15 = 30 Marks)
