

(Pages : 4)

K – 2423

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1331.1 : OPTICS, MAGNETISM AND ELECTRICITY

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** the questions. Answer should not exceed **2** sentences. Each question carries **1** mark.

1. What is interference?
2. Explain the phenomenon behind diffraction.
3. How is Newton's ring formed?
4. What is the principle behind the working of a LASER?
5. What is an optical pumping? give example
6. Name four elements which exhibit paramagnetism.
7. Define the term magnetic permeability.
8. What do you mean by resonant frequency?

P.T.O.

9. What is the practical application of a series LCR circuit?
10. What do you mean by power factor?

(10 × 1 = 10 Marks)

PART – B

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

11. Write note on the comparison of prism spectra and grating spectra.
12. What is Fraunhofer diffraction?
13. State the principle of superposition of waves.
14. What do you understand by
 - (a) fringes of equal thickness
 - (b) fringes of equal inclination?
15. Explain briefly about spontaneous emission.
16. Write a short note on magnetic susceptibility.
17. Compare the magnetic properties of diamagnetic, paramagnetic and ferromagnetic materials.
18. Write note on population inversion.
19. Write note on ferromagnetism.
20. Briefly explain about choke coil and its applications.
21. Write note on stimulated emission.
22. Explain about the resolving power of a plane diffraction grating.

23. What do you mean by the dispersive power of a grating? On what factors do it depends.
24. What do you mean by fringe width of interference? On what factors do it depends on?
25. With a neat diagram explain about the series RC circuit.
26. Mention the uses of transformers.

(8 × 2 = 16 Marks)

PART – C

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

27. In a Newton's rings experiment with air film the diameter of the m^{th} dark ring is 0.577 cm. With a liquid film the same arrangement gives similar rings but the diameter of the m^{th} ring becomes 0.434 cm. Find the refractive index of the liquid.
28. A parallel beam of light of wavelength 4500Å is incident at an angle of 30° on a plane transmission grating which has 9000 lines / cm. find the highest order spectrum that can be observed.
29. Light of wavelength 6000Å is incident on a narrow slit of width 0.30mm. The screen is placed 2m away from the slit. Find (a) the position of the first dark fringe and (b) the width of the central bright fringe.
30. Two coherent are 0.15mm apart and the fringes are observed on a screen 50cm away. It is found that with a certain monochromatic source of light, the fourth bright fringe is situated at a distance of 10.5 mm from the central fringe. Calculate the wavelength of light.
31. If the number of lines per millimetre of a grating is 589, how many orders of spectra are possible for light of wavelength 6.00×10^{-7} m?
32. A soft iron ring has a mean diameter of 0.2m and an area of cross section of 5×10^{-4} m². It is uniformly wound with a coil of 2000 turns and a current of 2A is passed through it. The magnetic flux produced in the iron ring is 8×10^{-3} Wb. Calculate the relative permeability of iron.

33. A step down transformer is connected to a mains supply of 220 volts is made to operate a 12 volt 40 watt bulb. Ignoring the energy losses, calculate (a) current in the primary coil (b) transformation ratio, assuming that there is no loss of power.
34. Find the natural frequency of a circuit containing an inductance of $50 \mu\text{H}$ and capacitor of capacity $0.001 \mu\text{F}$.
35. An AC of 180 volts and 100Hz is fed to a circuit containing a resistance R and capacitance C connected in series. Calculate the values of R and C when the maximum current is 5 A and active power is 300 watts.
36. Find the numerical aperture and acceptance angle of a core index 1.5 and $\Delta = 0.05$.
37. A step-index fiber has a core index of refraction of $n_1 = 1.425$. The cut-off angle for light entering the fiber from air is found to be 8.50° . Calculate (a) numerical aperture (b) index of refraction of the cladding (c) If the fiber were submersed in water, what would be the new numerical aperture and cut-off angle? [given $n_{\text{air}} = 1.0003$]
38. In a series RLC, circuit $R = 30 \Omega$, $L = 15 \text{ mH}$, and $C = 51 \mu\text{F}$. If the source voltage and frequency are 12 V and 60 Hz, respectively, what is the current in the circuit?

(6 × 4 = 24 Marks)

PART – D

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

39. Describe briefly about the light propagation in optical fibre and mention its applications.
40. Explain the electron theory of magnetism and the explanation of ferromagnetism.
41. Explain with the neat diagram the series LCR circuit and its resonance.
42. Explain the theory of interference and conditions for maximum and minimum intensities with equations.
43. Explain the Fresnel's diffraction at straight edge and discuss the pattern.
44. Comment on the long distance power transmission, transformers and its uses.

(2 × 15 = 30 Marks)

(Pages : 4)

K – 2404

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Mathematics

Core Course — II

MM 1341 : ELEMENTARY NUMBER THEORY AND CALCULUS — I

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION I

All the questions are compulsory. Each question carries 1 mark.

1. State the Inclusion-Exclusion Principle for 3 finite sets A , B and C .
2. Define a Linear Diophantine Equation in two variables.
3. Define Derivative of a vector-valued function $r(t)$.
4. Evaluate the definite integral, $\int_0^2 2ti + 3t^2 j dt$.
5. Define Unit Normal Vector.
6. Give the formula for a_N , the normal component of acceleration for a moving particle in terms of the velocity v and the acceleration a .

P.T.O.

7. Find the natural domain of $f(x, y, z) = \sqrt{1 - x^2 - y^2 - z^2}$.
8. Define an Open set.
9. Define Gradient of a function $f(x, y, z)$.
10. State the Extreme value theorem.

SECTION II

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

11. State and prove the Pigeonhole Principle.
12. Express $3ABC_{\text{sixteen}}$ in base 10.
13. Find $(4076, 1024)$.
14. Prove that two integers a and b are relatively prime if and only if $[a, b] = ab$.
15. Let $r(t) = t^2 i + e^t j - (2 \cos \pi t) k$. Find $\lim_{t \rightarrow 0} r(t)$.
16. Define a tangent vector and tangent line through the point P on the graph of a vector-valued function $r(t)$.
17. State the chain rule for differentiation of vector functions.
18. A particle moves through 3-space in such a way that its velocity is $v(t) = i + t j + t^2 k$. Find the coordinates of the particle at time t .
19. Define Level surfaces and find the level surfaces of $f(x, y, z) = z^2 - x^2 - y^2$.
20. Define local linear approximation to $f(x, y)$ at (x_0, y_0) .
21. Consider the ellipsoid $x^2 + 4y^2 + z^2 = 18$. Find an equation of the tangent plane to the ellipsoid at the point $(1, 2, 1)$.
22. Explain the steps to find the absolute extrema of a continuous function f of two variables on a closed and bounded set R .

SECTION III

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

23. Find the number of integers ≤ 3000 and divisible by 3, 5 or 7.
24. Prove that if a and b are positive integers, then $[a, b] = \frac{ab}{(a, b)}$.
25. Using canonical decomposition, find the LCM of 1050 and 2574.
26. Find parametric equations of the tangent line to the circular helix $x = \cos t, y = \sin t, z = t$ where $t = t_0$, and use that result to find parametric equations for the tangent line at the point where $t = \pi$.
27. If $r_1(t)$ and $r_2(t)$ are two vector functions of t , derive the expression for $\frac{d}{dt}(r_1 \times r_2)$.
28. Find $r(t)$ given that $r'(t) = (3, 2t)$ and $r(1) = (2, 5)$.
29. Assuming that polynomials in one variable and cosine function are continuous, show that $f(x, y) = \cos(3x^3 y^4)$ is continuous everywhere. State the results used for the proof.
30. Differentiability of function $f(x, y)$ at a point implies continuity at that point. Justify the statement.
31. Suppose that $w = x^2 + y^2 - z^2$ and $x = \rho \sin \phi \cos \theta, y = \rho \sin \phi \sin \theta, z = \rho \cos \phi$ use appropriate forms of the chain rule to find $\frac{\partial w}{\partial \rho}$ and $\frac{\partial w}{\partial \theta}$.

SECTION IV

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

32. (a) State and Prove the Fundamental Theorem of Arithmetic.
- (b) Let $b \geq 2$ be an integer and $b+1$ integers are randomly selected. Prove that the difference of two of them is divisible by b .

33. (a) If a circle is parameterised by arc length as

$$r(s) = a \cos\left(\frac{s}{a}\right) i + a \sin\left(\frac{s}{a}\right) j \quad (0 \leq s \leq 2\pi a). \text{ Find } T(s) \text{ and } N(s).$$

- (b) Find the curvature $k(t)$ for the circular helix $x = a \cos t, y = a \sin t, z = ct$ where $a > 0$.

34. Given $f(x, y) = \frac{xy}{x^2 + y^2}$, find the limit of $f(x, y)$ as $(x, y) \rightarrow (0, 0)$ along

- (a) The x-axis
- (b) The y-axis
- (c) The line $y = x$
- (d) The line $y = -x$
- (e) The parabola $y = x^2$.

35. Explain Lagrange multipliers Method and use it to determine the dimensions of a rectangular box, open at the top, having a volume of 32 ft^3 , and requiring the least amount of material for its construction. Given the surface area being $S = xy + 2xz + 2yz$.
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(Pages : 4)

K – 2423

Reg. No. :

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First Degree Programme under CBCSS

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Complementary Course for Mathematics

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(2019 Admission Regular)

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(Pages : 24)

K – 2116

Reg. No. :

Name :

Third Semester B.A./B.Sc. Degree Examination, March 2021

First Degree Programme Under CBCSS

English – (Language Course)

EN 1311.1/EN 1311.3 : ENGLISH FOR CAREER

(Common for B.A./B.Sc. and Career Related 2(a))

(2019 Admission, Regular)

Time : 3 Hours

Max. Marks : 80

- I. Answer **all** the following questions. Follow the instructions given in the brackets wherever needed.
1. The correct spelling of the word 'exhibition' is _____
2. The word that is the antonym of "economical" is _____
3. 'Fragrance' is a word related to the sense of _____
4. _____ is the noun form of 'emigrate'.
5. It _____ (be) an honour for him to lead and serve the company.
(Use the correct tense form of the verb in brackets)
6. Do you know where is the church. (Correct the sentence)
7. What number of students are in this class? (Underline the error)
8. The term 'epidemiological' is related to the study of _____

P.T.O.

9. How much costs it to buy a diamond necklace?

(Correct the sentence)

10. They had to _____ the meeting yesterday due to the sudden bus strike.

(Use the appropriate phrasal verb which means "cancel or stop")

(a) Call up

(b) Call for

(c) Call off

(d) None of these

(10 × 1 = 10 Marks)

II. Answer **any eight** of the following questions.

11. Provide one word substitutes for any two of the phrases

(a) Stood up and applauded

(b) A piece of writing about the writer's journeys to different places

(c) A person who collects stamps

(d) A person who walks in her/his sleep

12. Give the antonyms of two of the following words

(a) convergence

(b) sensibility

(c) unknown

13. Give the synonym of two of the following words

(a) hilarious

(b) outlook

(c) modify

14. Make sentences of your own with any two of the following phrasal verbs
- (a) ran into
 - (b) turned up
 - (c) to make light of
 - (d) made off with
15. Choose the correct option from the brackets :
- (a) The Manager _____ all the claims of the employee and dismissed him. (reputed / refuted).
 - (b) I suppose the headmaster himself will _____ the matter now. (look into / look out for)
16. Fill in the blanks using a collective noun from those given below (band, pride, herd, bunch, clutch) :
- (a) We saw a _____ of elephants moving across the river bed.
 - (b) The rock _____ has been on tour for months.
17. Fill in the blanks using the suitable degree of the adjective given in brackets :
- (a) Lead is _____ than any other metal. (heavy)
 - (b) He thinks he is _____ than his father. (wise)

Correct the error in the words / phrases given in italics :

18. (a) *Poorness* is not an enviable condition.
- (b) Here are the mangoes; please don't *take this* that are rotten.

19. (a) Suman studied in a *girls'* school till her tenth class.
(b) Can you give me some *informations* on the uses of lasers?
20. (a) Environmental degradation is a *pereniel* problem for humans today.
(b) My cousin likes fruits of *forin* countries.
21. (a) Your targets are *to achieving* before the end of this month.
(b) The clothes were all washed and *hanged out* to dry.
22. Fill in the blanks with suitable words from those given in brackets.

(when, enough, leisurely, rather)

- (a) He is a _____ careless fellow.
(b) These are days _____ no one can have a sense of security.
(c) He was foolish _____ to believe her.
(d) I had a _____ walk.
23. Fill in the blanks with suitable words from those given in brackets.

(medical, deliberate, grand, constant)

- (a) The battle of Waterloo ended in a _____ victory.
(b) The injured man wants _____ advice.
(c) _____ anxiety has undermined his health.
(d) It is a _____ lie.

Read the paragraph and answer the question given below :

24. The global anti-ageing market is worth at least \$250 billion - an astonishing amount, and it's growing. Anti-ageing treatments are supposedly used to correct 'premature ageing'. But what does this really mean? Surely ageing is just ageing. It is a process that occurs over time- at the time that it's supposed to.

- (i) The word 'premature' is used in the passage to mean :
- (ii) What is meant by the 'anti-ageing market' and what is it worth?

25. We do not know how to manage our machines. Machines were made to be man's servants: yet he has grown so dependent on them that they are in a fair way to become his masters. Already most men spend most of their lives looking after and waiting upon machines. And machines are very stern masters. They must be fed with coal, and given petrol to drink, and oil to wash with, and must be kept at the right temperature, and if they do not get their meals when they expect them, they grow sulky and refuse to work, or burst with rage, and blow up and spread ruin and destruction all around them.

- (i) What has gone wrong in man's handling of machines?
- (ii) What does "stern masters" mean?

26. Bacon calls the riches, the baggage of virtue :

For, as the baggage is to an army, so riches are to virtue. They cannot be spread nor left behind. Yet only hinder the march. Wealth brings care in its train. Pride goes with it. And where there is pride, there can be no real virtue.

What did Christ say of a rich man? "Verily, I say unto you, it is easier for a camel to go through the eye of a needle, than for rich man to enter the Kingdom of God".

- (i) Riches are called the baggage of virtue. Why?
- (ii) It is difficult for a man of riches to get into the kingdom of God. Why?

(8 × 2 = 16 Marks)

III. Answer **any six** of the following questions.

27. Fill in the blanks with the correct option

(a) He was asked to take his aged mother to see a _____ physician.

(paediatric / geriatric)

(b) The server at the bank was _____ by cybercriminals.

(morphed / hacked)

(c) Prof. Harvey uses a lot of scientific _____ in his speeches.

(jokes / jargon)

(d) I'm just waiting for my father's nod of _____ so that I can go abroad to work.

(assent / asset)

28. Fill in the blanks with suitable phrases from those given in brackets

(make up, turned up, went off, ran out, called off, look into, look up, look for)

(a) The workers _____ the strike.

(b) The boys _____ at the stroke of the ball.

(c) Surprisingly, very few guests _____ for the wedding.

(d) A bomb _____ near the park yesterday.

29. Correct the error in **four** of the following sentences :

(a) More than one attempt were made to rush on to the stage.

(b) The Central Government not only provided the funds but the personnel also.

(c) His wife, as well as his children are ashamed of him.

(d) John thinks he is superior than everybody else.

30. Fill in the blanks with the correct option

- (a) All kinds of foreign consumer brands are now available at our store, because of the _____ policy (localisation / liberalisation)
- (b) His decision to relocate to his native town was a _____ one.
(judicious / judicial)
- (c) Why don't you _____ me instead of sending long e mails?
(next / text)
- (d) The story is about two families that have an ongoing _____ that goes back three generations. (food / feud)

31. Fill in the blanks with suitable phrases from those given in brackets :

(step down, held up, gave up , cut off, made up, found out)

- (a) The energy company _____ our electricity because we didn't pay.
- (b) I _____ playing football a long time ago because of a knee injury.
- (c) The Prime Minister has decided to _____ after 10 years in office.
- (d) The traffic on the motorway was _____ by construction work.

32. Correct the error, if any, in the section in italics in **four** of the following sentences :

- (a) I have spoken to him, but *what he could do* is another matter.
- (b) Dr. Shah will be leading the surgical team, *will he?*
- (c) I am supposed to join you at two in the afternoon, *aren't I?*
- (d) *Don't she know* that she has a seminar presentation tomorrow?
- (e) *You don't walk* on the grass, the signboard says.

33. Fill in the blanks with the suitable pronouns from those given in brackets :

(they, he, me, our, you, it, they, them, its, mine, him)

(a) You are stronger than _____

(b) I looked behind _____

(c) He said he had reported the incident to two constables but that none of _____ was willing to intervene.

(d) Nobody but _____ was present.

(e) There were doors all around the hall, but _____ were all locked.

(f) My parents like Latin music. The CD is for _____

(g) Here is another souvenir. I don't know what to do with _____

(h) Dad is coming with _____ to buy school supplies.

34. Correct the error in the sections in italics :

(a) She *must has been* on holiday.

(b) Vani is *as tall as* all other girls in her class.

(c) Your college is good, but mine *is best*.

(d) It rains heavily in Assam, *is'nt it?*

35. Fill in the blanks with suitable words from those given in brackets :

(failure, contact, agonisingly, crash-landed, probe, journeying, successfully)

Over the weekend, India attempted to make history by becoming just the fourth nation to _____ land a _____ on the Moon. It came _____ close, but after _____ millions of kilometres, Vikram lander lost _____ in the final few hundred metres and _____ on the lunar surface. But it would be both unfair and plain wrong to label the mission a _____

36. Fill in the blanks with suitable words from those given in brackets :

(alarmed, embodiment, ambitious, necessities, sceptical, melancholic, improved, revoked)

- (a) The Manager says that the order cannot be _____
- (b) We should use _____ varieties of seeds to increase production of grains.
- (c) Bruto was an unselfish worker. Yet people said that he was _____
- (d) His father is _____ about the son getting a top rank.
- (e) The residents were _____ by the fury of the storm.
- (f) The music had a _____ touch.
- (g) Many of the villages in India do not even have the bare _____ of life.
- (h) Mother Teresa is regarded as an _____ of kindness and love.

37. Read the passage and answer the questions given below :

Raman was a voracious reader and pored eagerly over all books in his father's collection, among which were original writings of great scientists. These books were to him like old friends, never to be forgotten. He once said, 'Out of this welter of subjects and books, can I pick anything really to mould my mental and spiritual outlook and determine my chosen path'?

(i) _____ in the passage means 'highly enthusiastic'.

(ii) 'Pored eagerly over' means _____

(a) read with great interest (b) studied carefully

(c) both (a) and (b) (d) skimmed through

(iii) In the given passage, 'mould' is related to

(a) the smithy (b) pottery

(c) baking (d) character

(iv) 'Welter' means _____

38. Read the passage and answer the questions given below :

There has never been conceived or made by man any instrument, machine or contrivance, capable of such diversity of usefulness as the human hand. Nothing has ever existed with such infinite adaptability to various need, or capable of being trained to such degrees of dexterity and versatility. Nor is it likely that as perfect a machine, will ever be produced by human skill, for the only thing, the human hand cannot do is, to create an instrument as perfect as itself.

(i) Why is the human hand so useful?

(ii) 'Adaptability' means _____

(iii) _____ in the passage means 'an apparatus using mechanical power and having several parts, each with a definite function and together performing a particular task'.

(iv) Can as perfect an instrument as the human hand be ever created by man?

(a) Can be created.

(b) There are similar instruments as useful as the human hand.

(c) Human hand or mind is incapable of making a similar machine as human hand. **(6 × 4 = 24 Marks)**

IV. Answer **any two** of the following questions, choosing **one from each group**.

GROUP – A

39. Read the following passage and answer the questions given below :

Once the casting is done, I am ready to plunge headlong into the business of shooting. The studios of Calcutta show their hallowed past in every crevice in the wall, in every tatter on the canvas that covers the ceiling. Some of the families of rodents that inhabit the rafters have lived there ever since the foundation of the industry. The floor is pitted, the camera groans as it turns, the voltage begins to drop after sundown. The general air of shabbiness is unnerving. And yet I do not mind these at all. I do not think of these as hindrances. After all, we have the essentials to make a film, and it is within us to make it badly or well. It is the bareness of means that forces us to be economical and inventive, and prevents us from turning craftsmanship into an end in itself. And there is something about creating beauty in the circumstances of shoddiness and privation that is truly exciting...Yes, I am happy to be working where I am.

1. 'Plunge headlong into' means _____

(a) dive into water

(b) bang your head

(c) to get fully involved

(d) none of the above

2. 'Hallowed' is closest in meaning to _____

(a) holy

(b) hollow

(c) ancient

(d) unknown

3. _____ is a synonym for 'creative'.
4. Another word from the passage that is close in meaning to 'shabbiness' is _____
5. 'Privation' is a word related to _____
- (a) privatisation (b) privacy
- (c) piracy (d) deprivation
6. 'Tattered' is related _____
- (a) paper (b) cloth
- (c) noise (d) music
7. The word opposite in meaning to the word 'pitted' is
- (a) smooth (b) rough
- (c) full of holes (d) clean
8. The word that is spelt correctly is
- (a) privetisation (b) shoddiness
- (c) craftsmanship (d) crivice
9. The word that is spelt wrongly is : _____
- (a) ceiling (b) voltage
- (c) hinderance (d) business

40. Spot the error in the underlined sections in the following sentences. If there is no error, the answer is 'd'

1. You may go to your classes now, The Teacher said. No error

a b c d

2. Ravi asked Megha whether she is submitted her assignment

a b

the class teacher. No error

c d

3. 'I will not go into the hall until Resmi comes', said Jyothi. No error.

a b c d

4. 'Where did you lose your purse', asked my mother. No error.

a b c d

5. The group promised that they would meet again next year. No error

a b c d

6. Twenty hundred weights make one ton. No Error.

a b c d

7. All the three commander-in chiefs are meeting the President today.

a b c

No error.

d

8. I who your leader will give the signal. No error.

a b c d

9. Nothing is given for nothing. No error.

a b c d

10. Let you and he go together. No error.

a b c d

11. He failed in he attempted. No error.

a b c d

12. He knows better than to quarrel. No error.

a b c d

13. Few Indian towns are so big as Madras. No error.

a b c d

14. Why should I suspected by you. No error.

a b c d

15. Either he or I are mistaken. No error.

a b c d

41. Read the passage and answer the questions given below :

Monday morning found Tom Sawyer miserable. Monday morning always found him so- because it began another week's slow suffering in school. He generally began that day with wishing he had had no intervening holiday, it made the going into captivity and fetters again so much more odious. Tom lay thinking. Presently it occurred to him that he wished he was sick; then he could stay home from school. Here was a vague possibility. He canvassed his system. No ailment was found, and he investigated again. This time he thought he could detect colicky symptoms, and he began to encourage them with considerable hope. But they soon grew feeble, and presently died wholly away. He reflected further. Suddenly he discovered something. One of his upper front teeth was loose. This was lucky; he was about to begin to groan as a 'starter', as he called it, when it occurred to him that if he came into court with that argument, his aunt would pull it out, and that would hurt. So he thought he would hold the tooth in reserve for the present, and seek further. Nothing offered for some little time, and then he remembered hearing the doctor tell about certain thing that laid up a patient for two or three weeks and threatened to make him lose a finger. So the boy eagerly drew his sore toe from under the sheet and held it up for inspection. But now he did not know the necessary symptoms. However, it seemed well worthwhile to chance it, so he fell to groaning with considerable spirit.

1. The word 'reflected' in the passage is closest in meaning to :
 - (a) consider
 - (b) echoed
 - (c) returned
 - (d) replicated

2. The phrase 'canvassing the system' in the passage means :
 - (a) appeal
 - (b) campaign
 - (c) fight
 - (d) check

3. The word in the passage which is the opposite of 'pleasing' is :
 - (a) suffering
 - (b) intervening
 - (c) colicky
 - (d) odious

4. Identify the statement which is true :
 - (a) Tom thought it was bad luck to have a shaky front tooth
 - (b) Tom hated being sick
 - (c) Tom began to encourage the colicky pain with hope
 - (d) None of the above

5. Monday morning found Tom Sawyer miserable. Why?
 - (a) Tom was feeling colicky
 - (b) Tom had a tooth ache
 - (c) Tom was scared of going to the doctor
 - (d) Tom did not like going to school

6. Why did Tom wish he had had no intervening holiday?
 - (a) It made going back to school so much more hateful
 - (b) Tom did not want to stay at home
 - (c) School was always great fun for Tom
 - (d) All of the above

7. "Ailment" means _____
8. The synonym for "fettters" is
 - (a) fritters
 - (b) chains
 - (c) fight
 - (d) check
9. By which phrase does Tom describe his experience in school?
10. The word "sore" in the phrase "sore toe" means
 - (a) big
 - (b) broken
 - (c) letters
 - (d) none of the above
11. Why did Tom canvass his system?
12. Why did Tom hold up the sore toe for inspection?
13. What was the 'starter' for Tom Sawyer?
14. Based on the incident mentioned here, comment briefly on the character of Tom Sawyer?
15. Suggest a suitable title for the passage.

GROUP – B

42. Answer **all** the following questions :

Fill in the blanks with suitable **tense** forms of the verbs given in brackets :

1. Nadella _____ (choose) to join Microsoft because he _____ (want) to make a difference.
2. It _____ (be) an honour for him to lead and serve the company.
3. We _____ (go) for a movie yesterday. _____ (Do) you _____ (know) that my friend's daughter _____ (act) in that movie? She _____ (play) the role of the heroine's younger sister, but it _____ (be) an important role. None of us _____ (expect) her to do so well, but she _____ (do) a great job. I _____ (hear) that she even _____ (win) an award for her role. Our club _____ (host) a reception for her when she _____ (come) to our town next month.

Fill in the blanks with suitable prepositions :

4. He warned you _____ the danger, but you did not listen _____ him.
 5. France is famous _____ its perfumes. You are looking _____ some _____ the most expensive brands available _____ this country.
 6. This company deals _____ electronic goods. Ajay's been working here as Manager _____ two years now.
 7. Rewrite the following sentence into active voice :
 - (a) Cricket is played in most countries today.
 - (b) Will you be supported by your friends in this venture?
43. Read the passage and answer the questions given below :

Muhammad Yunus, the founder of Grameen Bank, is a Bangladeshi banker, author and economist whose focus on microcredit and microfinance concepts led to him being awarded the Nobel Prize in 2006 for efforts to create economic and social development from below'. Yunus was born in 28 June 1940 in Chittagong. His father was jeweler and his mother was his role model; a women who helped anyone that knocked on their door. After high school and college, Yunus completed his PhD in Economics in the US and worked as an assistant professor of Economics till 1972, when he returned to Bangladesh. It was during this time that Yunus would stumble across an idea that lead to him helping millions of poverty people and would lead to him being awarded the Nobel Prize.

In 1974, Bangladesh suffered from a famine, resulting from rain and massive flooding that devastated crops. And the people of Bangladesh received no relief or aid from other countries. Yunus began to be actively involved in poverty reduction. He established a rural economic program as a research project and visited the poorest households in a village near Chittagong. He interviewed a woman who was making bamboo stools and learnt that she was being charged

7. The word that is the antonym of 'urban' is _____
8. 'Exhibition of ' means _____
- (A) Display (B) Open Mindedness
(C) Expression (D) None of the above
9. The wrongly spelt word is :
- (A) Exorbitant (B) Advantageus
(C) Microcredit (D) Potential
10. The correctly spelt word is :
- (A) Povertystruck (B) Exhibition
(C) Famin (D) Poverty Stricken
11. I suppose the headmaster himself will _____ the matter now.
- (A) Look into (B) Look at
(C) Look out for (D) Look up
12. In spite of our best efforts at secrecy, my mother _____ our plans for a surprise party.
- (A) Turn up (B) Got wind of
(C) Caught up with (D) Wound up
13. A person who studies human cultures and societies is _____
- (A) A philologist (B) An archaeologist
(C) An anthropologist (D) A linguist
14. Correct the spelling of the following word and make a sentence of your own 'necessity'.

Find the antonyms of the words in italics :

15. *Escalating* prices cause hardship to the poor

- (A) Fixed (B) Falling
(C) Reasonable (D) Fluctuating

44. Answer **all** the following questions :

Fill in the blanks with suitable modal auxiliaries from the list given below :

(will, would, should, can, must, might, need, dare, used to)

1. Sara _____ to do some exercises for her shoulder, otherwise she _____ need a surgery.
2. You _____ have spoken rudely to her, otherwise she _____ not have left soon.
3. _____ you sing a song for Tara's birthday? You _____ sing so well when we were in school.
4. I _____ not climb up the hill, it _____ be slippery after such heavy rain.
5. _____ you be coming tomorrow? We really _____ complete that file.

Complete the following sentences with suitable verbs and corresponding question tags :

6. You aren't coming to college tomorrow, _____?
7. Rahman _____ the boy who stood first in class, isn't he?
8. Jaya goes to the library every Saturday, _____?
9. Let us all go for a movie next Sunday, _____?
10. _____ as tall as Rosy, aren't I?

Insert the adverb given in brackets in the correct position in the sentence :

11. She impressed him by her singing. (greatly)
12. There was nothing to do but wait for the next bus to arrive. (else)
13. He admires my clothes. (always)
14. This room is big enough for all of us to sleep in. (enough)
15. The new tax structure is tough on the middle classes. (rather)

(2 × 15 = 30 Marks)

(Pages : 6)

K – 2425

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme Under CBCSS

Mathematics

Core Course

MM 1341 — ELEMENTARY NUMBER THEORY AND CALCULUS – I

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer all questions from 1 to 10. Each question carries 1 mark.

1. State the division algorithm.
2. State the pigeonhole principle.
3. If $r(t) = t^2i + e^tj - (2 \cos \pi t)k$, find $r'(t)$.
4. Evaluate the definite integral $\int_0^2 (2ti + 3t^2j) dt$.
5. Write the formula for finding the arc length of a parametric curve $x = x(t)$, $y = y(t)$, $a \leq t \leq b$.
6. Find a parametrization of the cone $z = \sqrt{x^2 + y^2}$, $0 \leq z \leq 1$.

P.T.O.

7. Let $f(x, y) = \sqrt{y+1} + \ln(x^2 - y)$. Find $f(e, 0)$.
8. Evaluate $\lim_{(x,y) \rightarrow (-1,2)} \frac{xy}{x^2 + y^2}$.
9. Find $\frac{\partial w}{\partial x}$ if $w = 2ye^z \sin xz$.
10. Define the gradient of the function $f(x, y, z)$.

PART – B

Answer **any eight** questions from 11 to 26. **Each** question carries **2** marks.

11. Let b be an integer ≥ 2 . Suppose $b+1$ integers are randomly selected. Prove that the difference of two of them is divisible by b .
12. State the Inclusion Exclusion principle.
13. If $a | c$ and $b | c$, and $(a, b) = 1$, show that $ab | c$.
14. If p is a prime and $p | ab$, show that $p | a$ or $p | b$.
15. Sketch the graph and a radius vector of $r(t) = \cos t i + \sin t j$, $0 \leq t \leq 2\pi$.
16. Find the arc length of that portion of the circular helix $x = \cos t$, $y = \sin t$, $z = t$ from $t = 0$ to $t = \pi$.
17. Determine whether $r(t) = t^3 i + (3t^2 - 2t)j + 5t^2 k$ is smooth or not.
18. Find the unit tangent vector to the graph of $r(t) = t^2 i + t^3 j$ at the point $t = 2$.
19. Find the instantaneous velocity and speed of a particle that moves in a circular path such that its x and y coordinates at time t are $x = 2 \cos t$, and $y = 2 \sin t$.
20. Find the curvature of a circle of radius a .

21. Evaluate $\lim_{(x,y) \rightarrow (0,0)} \frac{-xy}{x^2 + y^2}$ along the parabola $y = x^2$.
22. Find f_x and f_y for $y(x, y) = 2x^3y^2 + 2y + 4x$.
23. Show that $f(x, y) = x^2 + y^2$ is differentiable at $(0, 0)$.
24. Using the chain rule find dz/dt if $z = x^2y, x = t^2, y = t^3$.
25. Let $f(x, y) = x^2e^y$. Find the maximum value of a directional derivative at $(-2, 0)$ and find the unit vector in the direction in which the maximum value occurs.
26. Find the equation of the tangent plane to the ellipsoid $x^2 + 4y^2 + z^2 = 18$ at the point $(1, 2, 1)$.

PART – C

Answer **any six** questions from 27 to 38. Each question carries **4** marks.

27. Let a and b be any positive integers. Show that the number of positive integers $\leq a$ and divisible by b is $[a/b]$.
28. Find the primes such that the digits in their decimal values alternate between 0's and 1's, beginning with 1 and ending in 1.
29. Let f_i denote the i -th Fermat number. Show that $f_0 f_1 \dots f_{n-1} = f_n - 2$, where $n \geq 1$.
30. Show that there are infinitely many primes of the form $4n + 3$.
31. The graphs of $r_1(t) = (\tan^{-1} t)i + (\sin t)j + t^2k$ and $r_2(t) = (t^2 - t)i + (2t - 2)j + \ln t k$ intersect at the origin. Find the degree measure of the acute angle between the tangent lines to the graphs of $r_1(t)$ and $r_2(t)$ at the origin.

32. Find $T(t)$ and $N(t)$ for the circular helix $x = a \cos t$, $y = a \sin t$, $z = ct$, where $a > 0$.
33. Find the curvature and radius of curvature of $r(t) = 5 \cos t i + 12 \sin t j + t k$ at $t = \pi/2$.
34. Find the arc length parametrization of the circular helix $r = \cos t i + \sin t j + t k$ that has reference point $r(0) = (1, 0, 0)$ and the same orientation as the given helix.
35. Confirm that the mixed partial derivatives of $f(x, y) = 4x^2 - 8xy^4 + 7y^4 - 3$ are equal.
36. Suppose that $w = \sqrt{x^2 + y^2 + z^2}$, $x = \cos \theta$, $y = \sin \theta$, $z = \tan \theta$. Use the chain rule to find $dw/d\theta$ when $\theta = \pi/4$.
37. Find the directional derivative of $f(x, y) = e^{xy}$ at $(-2, 0)$ in the direction of the unit vector that makes an angle $\pi/3$ with the positive axis.
38. Find the parametric equations of the tangent line to the curve of intersection of the paraboloid $z = x^2 + y^2$ and the ellipsoid $3x^2 + 2y^2 + z^2 = 9$ at the point $(1, 1, 2)$.

PART – D

Answer **any two** question from 39 to 44. **Each** question carries **15** marks.

39. (a) State and prove the fundamental theorem of arithmetic.
- (b) Show that the linear Diophantine equation (LDE) $ax + by = c$ is solvable if and only if $d | c$, where $d = (a, b)$. Also show that if x_0, y_0 is a particular solution of the LDE, then all its solutions are given by $x = x_0 + \left(\frac{b}{d}\right)t$,
 $y = y_0 - \left(\frac{a}{d}\right)t$ where t is an arbitrary integer.

40. (a) Let $\alpha = \frac{1+\sqrt{5}}{2}$. Show that $\alpha^{n-2} < F_n < \alpha^{n-1}$, where $n \geq 3$ and F_n denotes the n -th Fibonacci number.
- (b) Show that the number of divisions needed to compute (a, b) by the euclidean algorithm is at most five times the number of decimal digits in b , where $a \geq b \geq 2$.
41. (a) The length, width and height of a rectangular box are measured with an error of at most 5%. Use a total differential to estimate the maximum percentage error that results if these quantities are used to calculate the diagonal of the box.
- (b) Let $L(x, y)$ denote the local linear approximation to $f(x, y) = \sqrt{x^2 + y^2}$ at the point $(3, 4)$. Compare the error in approximating $f(3.04, 3.98)$ by $L(3.04, 3.98)$ with the distance between the points $(3, 4)$ and $(3.04, 3.98)$.
42. Suppose that a particle moves through 3-space so that its position vector at time t is $r(t) = ti + t^2j + t^3k$.
- (a) Find the scalar tangential and normal components of acceleration at time t .
- (b) Find the scalar tangential and normal components of acceleration at time $t = 1$.
- (c) Find the vector tangential and normal components of acceleration at time $t = 1$.
- (d) Find the curvature at the point where the particle is located at time $t = 1$.

43. (a) Find the absolute maximum and minimum values of $f(x, y) = 3xy - 6x - 3y + 7$ on the closed triangular region R with vertices $(0, 0)$, $(3, 0)$ and $(0, 5)$.
- (b) Consider the ellipsoid $x^2 + 4y^2 + z^2 = 18$.
- (i) Find an equation of the tangent plane to the ellipsoid at the point $(1, 2, 1)$.
- (ii) Find parametric equations of the line that is normal to the ellipsoid at the point $(1, 2, 1)$.
- (iii) Find the acute angle that the tangent plane at the point $(1, 2, 1)$ makes with the xy -plane.
44. (a) Locate all relative extrema and saddle points of $f(x, y) = 4xy - x^4 - y^4$.
- (b) Find the points on the sphere $x^2 + y^2 + z^2 = 36$ that are closest to and farthest from the point $(1, 2, 2)$.
-

(Pages : 4)

K – 2405

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Statistics

Complementary Course For Mathematics

ST 1331.1 – STATISTICAL DISTRIBUTIONS

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

Use of statistical table and scientific calculator are permitted.

SECTION – A

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

1. What are the parameters of a binomial random variable with mean 4 and variance 3?
2. Find the coefficient of variation of Poisson distribution with mean 9.
3. If X is a Poisson variable such that $P(X = 1) = P(X = 2)$, obtain $P(X = 0)$.
4. If X and Y are independent uniform random variables over $[0, 2]$, determine $P(X < Y)$.
5. State the distribution of $Z = X + Y$, where X and Y are independent standard normal variables.

P.T.O.

6. Define exponential distribution.
7. Define type II beta distribution.
8. What do you mean by sampling distribution?
9. State the distribution of the ratio of two independent standard normal variables.
10. Define statistic.

(10 × 1 = 10 Marks)

SECTION – B

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

11. Define Bernoulli random variable.
12. Define hypergeometric distribution.
13. The ratio to 3 successes and 4 successes among seven independent Bernoullian trials is $\frac{1}{4}$. Find the probability of success.
14. If X follow uniform distribution with mean 1 and variance $\frac{4}{3}$, find $P(X < 0)$.
15. If $X \sim N(6, 2)$, find $P(1 < X < 3)$.
16. A horizontal line of length 5 units is divided by a point chosen at random into two parts. If the length of the first part is X , find $E[X(5 - X)]$.
17. What are the advantages of Chebychev's inequality?
18. What are the conditions for Lindberg-Levy form of central limit theorem?
19. Find the mean of a random variable following chi-square distribution with n degrees of freedom.

20. A random sample of size 25 is taken from $N(1, 9)$. What is the probability that the sample mean is negative?
21. State Bernoulli's weak law of large numbers.
22. Let X_1, X_2, \dots, X_n are independent exponential random variables with parameter λ . Show that $X = X_1 + X_2 + \dots + X_n$ follows gamma distribution.

(8 × 2 = 16 Marks)

SECTION – C

Answer any six questions. Each question carries 4 marks.

23. If $X \sim B(n, p)$, show that $\text{Cov} \left(\frac{X}{n}, \frac{n-X}{n} \right) = \frac{-pq}{n}$.
24. If X follows Poisson distribution with parameter unity, show that mean deviation about mean is $\frac{2}{e}$ times the standard deviation.
25. If X and Y are independent geometric variables with same parameter, find the conditional distribution of $X|X+Y$.
26. In a normal distribution 30% of the items are above 42 and 30% of the items are below 28. What are the mean and standard deviation of the distribution?
27. Derive the moment generating function of normal distribution.
28. If X follows beta distribution of the first kind with parameters p and q , show that $Y = \frac{X}{1-X}$ follow beta distribution of the second kind.
29. In a die throwing experiment using an unbiased die, X denotes the number shown by the die. Using Chebychev's inequality, prove that $P(|X - \mu| > 2.5) < 0.47$.

30. For a random sample of size 16 from $N(\mu, \sigma^2)$ population the sample variance is 16. Find a and b such that $P(a < \sigma^2 < b) = 0.6$.
31. If $X \sim N(0, 1)$, prove that $Y = X^2$ follow chi-square distribution with one degree of freedom.

(6 × 4 = 24 Marks)

SECTION – D

Answer any two questions. Each question carries 15 marks.

32. The numbers of printing errors per page reported in a book with 1000 pages published by a good published were noted.

No. of mistakes	0	1	2	3	4	5	6	7	8
No. of pages	626	285	65	15	6	2	1	0	0

Fit a Poisson distribution and calculate the theoretical frequencies.

33. State and prove the recurrence relation for central moments of a binomial distribution.
34. Derive the expression for central moments of a normal distribution.
35. If X is a random variable following F -distribution with (n_1, n_2) degrees of freedom. Show that $Y = \frac{1}{X}$ follows F -distribution with (n_2, n_1) degrees of freedom.

(2 × 15 = 30 Marks)

(Pages : 4)

K – 2121

Reg. No. :

Name :

Third Semester B.A./B.Sc. Degree Examination, March 2021

First Degree Programme Under CBCSS

Hindi

Language Course — (Additional Language — III)

HN 1311.1 — POETRY AND GRAMMAR

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

- I. एक या दो वाक्यों में उत्तर लिखिए।
1. सूरदास के गुरु कौन है?
2. हिन्दी किस लिपि में लिखी जाती है?
3. अष्टछाप की स्थापना किमने की?
4. तुलसीदास के बचपन का नाम क्या है?
5. तारसप्तक के सम्पादक कौन थे?
6. राष्ट्रकवि की उपाधि से सम्मानित कवि कौन है?
7. उजाला किसकी रचना है?
8. 'लड़का' शब्द का भाववाचक संज्ञा लिखिए।

P.T.O.

9. नागार्जुन ने मैथिली में किस नाम से लेखनी चलाई?

10. छायावाद के चार स्तंभ कौन-कौन हैं?

(10 × 1 = 10 Marks)

II. किन्हीं आठ प्रश्नों का उत्तर दो या तीन वाक्यों में लिखिए।

11. कबीरदास ईश्वर से भी अधिक महत्व किस को देते हैं? क्यों?

12. दूध पिलाने के लिए यशोदा कृष्ण को क्या प्रलोभन देती है?

13. तुलसीदास क्यों कहते हैं कि सन्त आम के पेड़ के समान हैं?

14. "जाति न पूछो साधु की, पूछि लीजिये ज्ञान।

मोल करो तलवार का, पड़ा रहन दो म्यान।"

- भाव समाझाइए।

15. "आवत ही हरषे नहीं नैनन नहीं स्नेह।

तुलसी तहाँ न जाइये कंचन बरसे मेघ।"

- भाव समाझाइए।

16. संज्ञा किसे कहते हैं? उसके भेद क्या-क्या हैं?

17. 'को' विभक्ति के विविध कारक रूपों का परिचय दीजिए।

18. भाववाचक संज्ञायें किस प्रकार के शब्दों से बनती हैं? उदाहरण सहित लिखिए।

19. विभक्ति और कारक में क्या भेद है?

20. आदिवासी नौजवान नदी को कैसे मलिन करता है?

21. उदयप्रकाश का लघु परिचय दीजिए।

22. यशोधरा क्यों दुखी है? स्पष्ट कीजिए।

23. सुमित्रानंदन पंत क्यों कहते हैं कि वे चिर सुख और दुख नहीं चाहते?

24. मुरझाया फूल किसका प्रतीक है? स्पष्ट कीजिए।

25. "सुनो हमें अनहद की तरह
और समझो जैसे समझी जाती है
नयी-नयी सीखी हुई भाषा।"
— भाव समझाइए।

26. "शक्ति रहे तेरे हाथों में -
छूट न जाये यह चाह सृजन की
शक्ति रहे तेरे हाथों में
रुक न जाए यह गति जीवन की।"
— भाव समझाइए।

(8 × 2 = 16 Marks)

III. किन्हीं छः प्रश्नों का उत्तर लिखिए।

27. बाल कृष्ण अपनी माता से किस बात की शिकायत करता है?

28. 'सुख और दुख' कविता में कवि के दार्शनिक विचार क्या हैं?

29. नैरागी के अनुसार वर्तमान मथुरा की स्थिति कैसी है?

30. 'उड़ चल हारिल' कविता में चित्रित कर्मरत जीवन पर प्रकाश डालिए।

31. "गोधन, गज धन, बाजि धन और रतन धन खान।
जन आवत संतोष-धन सन धन धूरि समान।"
— सप्रसंग व्याख्या कीजिए।

32. "बुरा जो देखन मैं चला, बुरा न मिल्या कोया।
जो दिल खोजा आपना, मुझ से बुरा न कोया।"
— सप्रसंग व्याख्या कीजिए।

33. आदरसूचक 'आप' और निजवाचक 'आप' में क्या अन्तर है? उदाहरण सहित लिखिए।

34. संख्यावाचक विशेषण और परिमाण वाचक विशेषण में क्या अन्तर है ?

35. स्त्रीलिंग संज्ञाओं के पहचान के किन्हीं पाँच नियम लिखिए।

36. "विश्व में है फूल, तू सबके हृदय भाता रहा,

दान कर सर्वस्व भी तू हाय हर्षाता रहा।

जन न तेरी दशा पर दुखा हुआ संसार को?

कौन रोएगा सुमन, हम से मनुज निस्सार को।"

— सप्रसंग व्याख्या कीजिए।

37. स्वयं सुसज्जित करके क्षण में

प्रियतम को प्राणों के पण में,

हमें भेज देती है रण में —

क्षात्र धर्म के नाते।

— सप्रसंग व्याख्या कीजिए।

38. 'उजाला' कविता में कवि ने क्या व्यक्त किया है?

(6 × 4 = 24 Marks)

IV. किन्हीं दो प्रश्नों के उत्तर लिखिए।

39. पठित पाठ के आधार पर कबीरदास के काव्य की विशेषताओं पर प्रकाश डालिए।

40. 'स्त्रियाँ' कविता का भाव समझाइए।

41. भिक्षुक कविता की समीक्षा कीजिए।

42. 'वह फिर जी उठी' कविता हमारे वर्तमान परिस्थिति से जुड़ी है। स्पष्ट कीजिए।

43. कारक की परिभाषा देकर उसके भेदों को उदाहरण सहित समझाइए।

44. सर्वनाम किसे कहते हैं उसके भेदों को सोदाहरण समझाइए।

(2 × 15 = 30 Marks)

(Pages : 4)

K – 2416

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Physics

Complementary Course for Mathematics

PY 1331.1 : OPTICS, MAGNETISM AND ELECTRICITY

(2018 Admission)

Time : 3 Hours

Max. Marks : 80

PART – A

Answer **all** the questions. Answer should not exceed **2** sentences.

Each question carries **1** mark.

1. What is Fraunhofer diffraction?
2. What is meant by grating element?
3. What are coherent sources?
4. Why Newton's rings are circular?
5. Name the active medium in a ruby laser.
6. Name four elements which exhibit ferromagnetism?
7. Define the term magnetic susceptibility.

P.T.O.

8. What do you mean by numerical aperture?
9. What is a transformer?
10. What do you mean by wattless current?

(10 × 1 = 10 Marks)

PART – B

Answer **any eight** questions. Answer should not exceed **one** small paragraph.

Each question carries **2** marks.

11. Distinguish between interference and diffraction.
12. Distinguish between dispersive power and resolving power of a grating.
13. Explain constructive interference with equations.
14. What are the applications of optical fibre?
15. What is an optical pumping? Give example.
16. Explain the magnetic properties of paramagnetic materials.
17. Write note on graded index fiber.
18. Write note on ferromagnetism.
19. Comment on the magnetic susceptibility and permeability of diamagnetic materials and give examples.
20. Briefly explain about principle of light propagation in an optical fiber.
21. Write note on the Propagation Modes of optical fiber.
22. Explain the terms angle of refraction and angle of incidence.

(8 × 2 = 16 Marks)

PART – C

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

23. A step index fibre has a numerical aperture of 0.20 and a cladding refractive index of 1.59. Find the acceptance angle for the fibre in water which has a refractive index of 1.33.
24. An optical fibre has an acceptance angle 34.72° . Calculate its numerical aperture. If the refractive indices of core and cladding are 1.53 and 1.42. Calculate its critical angle.
25. In Fraunhofer diffraction pattern due to a narrow slit a screen is placed 2m away from the lens to obtain the pattern. If the slit width is 0.5mm and the first minima lie 2mm on either sides of the central maximum, find the wavelength of light.
26. A parallel beam of light of wavelength 6000 \AA is incident at an angle of 30° on a plane transmission grating which has 5460 lines / cm. find the highest order spectrum that can be observed.
27. A specimen of radius 0.25cm is kept parallel to magnetising field 4000 Am^{-1} . It acquires a pole strength of 8Am. Calculate the magnetic susceptibility and permeability of the material.
28. A resistor of 3 ohms and a capacitor of capacity $800 \mu\text{F}$ are connected in series across 220 volts 50 cycles AC. Calculate
 - (a) capacitive reactance
 - (b) impedance
 - (c) current
 - (d) pd across the resistance
 - (e) pd across the capacitor
 - (f) the phase lag.

29. Find the value of the current through a inductance of 0.5H when connected to an AC source of 220V and 50cps is applied to it.
30. Diameter of a particular dark ring in Newton Rings experiment in reflected system is 0.8 mm. When a transparent liquid of refractive index 1.6 is placed between lens and the plate, calculate the diameter of ring.
31. A series RLC circuit consists of a 12Ω resistor, a $100 \mu\text{F}$ capacitor, and a 150 mH inductor. If the source frequency is 50 Hz, calculate the total impedance.

(6 × 4 = 24 Marks)

PART – D

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

32. Describe briefly about the light propagation in optical fibre and mention its applications.
33. With neat diagram explain about transformers, its different types and applications.
34. Give the theory of a plane transmission grating and describe how it is used to determine the wavelength of light, using grating at normal incidence with a neat diagram.
35. Discuss the interference in thin films-(reflected systems) and the effect of thickness of film.

(2 × 15 = 30 Marks)

(Pages : 4)

K – 2123

Reg. No. :

Name :

Third Semester B.A./B.Sc. Degree Examination, March 2021

First Degree Programme under CBCSS

Malayalam

Language Course – Additional Language III

ML 1311.1 : ഭൃശ്യകലാസാഹിത്യം

(2019 Admission - Regular)

Time : 3 Hours

Max. Marks : 80

- I. ഒരു വാക്കിലോ ഒന്നോ രണ്ടോ വാക്യത്തിലോ എല്ലാ ചോദ്യത്തിനും ഉത്തരമെഴുതുക.
1. നളചരിതം ആട്ടകഥയ്ക്ക് കാനാരതാരകം എന്ന വ്യാഖ്യാനം രചിച്ചതാര്?
 2. തുള്ളല്പ്രസ്ഥാനത്തിന്റെ ഉപജ്ഞാതാവാര?
 3. 'ബൈസിക്കിൾ തീവ്വ്' സിനിമയുടെ സംവിധായകൻ ആര്?
 4. 'കനലാട്ടം' ആരുടെ കൃതിയാണ്?
 5. വറീത് ഏതു കൃതിയിലെ കഥാപാത്രമാണ്?
 6. ലോഷയാത്ര തുള്ളലിന്റെ കഥ അരങ്ങേറുന്ന വനപ്രദേശം ഏത്?
 7. 'നല്ലതു നല്ലതിനോടേ ചേരണം' - ആരുടെ വാക്കുകളാണിത്?

P.T.O.

8. കാളിദാസന്റെ അഭിജ്ഞാനശാകുന്തളം നാടകത്തിന് ഏ.ആർ. തയ്യാറാക്കിയ പരിഭാഷയുടെ പേരെന്ത്?
9. നളന്റെ രാജ്യം ഏത്?
10. 'ഇവൾ തന്നെക്കൂടി അറിയുന്നില്ല. പിന്നെയങ്ങോ അതിമിയെ?' - ആരായിരുന്നു ആ അതിമി?

(10 × 1 = 10 Marks)

II. ഒരു ഖണ്ഡികയിൽ കവിയാതെ എട്ടു ചോദ്യത്തിന് ഉത്തരം എഴുതുക.

11. 'പ്രാന്നനാ, മരിക്കാതെ, മരണമില്ലാതെ എവിടോ കഴിയൂ' - ആരെക്കുറിച്ചാണ് പരാമർശം? വ്യക്തമാക്കുക.
12. 'അഗ്നിയല്ലാതെ ദഹിപ്പിക്കുമോ?' - സന്ദർഭവും ആശയവും വ്യക്തമാക്കുക.
13. 'നിനക്കറിയാ, നാട്ടിലോരോ കമ്പിക്കാലിനും ഞാൻ കടക്കാരനാ' - സൂചിതമെന്ത്?
14. ഭർത്തൃഗൃഹത്തിലേക്കു പോകുന്ന ശകുന്തളയെ ആശ്രമവൃക്ഷങ്ങൾ അനുഗ്രഹിച്ചതെങ്ങനെ?
15. 'വിധി മികവേറും നിന്നെ മമ സഖിയായിട്ടല്ല നല്ല നിധിയായിട്ടല്ലോ തന്നു' - സന്ദർഭം വ്യക്തമാക്കുക.
16. 'എനിക്കീ വേദാന്തമൊന്നും വേണ്ട' - ആരുടെ വാക്കുകൾ? സന്ദർഭം എഴുതുക.
17. 'ഭഗവാനേ, ഇതൊരാശ്ശിസല്ല, വരം തന്നെയാണ്' - സൂചിതമെന്ത്?
18. സഖിമാരേ! നമുക്കു ജനകപാർശ്വ
ചെന്നാലല്ലീ കൗതുകം? - വിവക്ഷിതമെന്ത്?
19. 'ഞങ്ങളെ നീ ആരുടെ കൈയിലാണ് ഏല്പിക്കുന്നത്?' - ആരുടെ വാക്കുകൾ? സന്ദർഭമേന്ത്?
20. തന്നെ പിടികൂടിയ നളമഹാരാജാവിനെ ഹംസം പുകഴ്ത്തുന്നതെങ്ങനെ?

21. 'ചേതമില്ലാത്തതാർക്കും ചെയ്തുകൊടുക്കണമഥ്രാ!' - ആരുടെ വാക്കുകൾ ? സന്ദർഭം എഴുതുക.
22. 'യൗവനം വന്നുദിച്ചിട്ടും ചെറുതായില്ല ചെറുപ്പം' - വക്താവാരാണ് ? സൂചിതമെന്ത് ?
23. 'കേട്ടാലും ദുരിതശാന്തി കേവലം നമുക്കുണ്ടാകും' - സൂചിതം വ്യക്തമാക്കുക.
24. വിറ്റോറിയോ ഡിസീക്കയെക്കുറിച്ച് കുറിപ്പെഴുതുക.
25. തുള്ളലിന്റെ ഉത്ഭവത്തെക്കുറിച്ചുള്ള ഐതിഹ്യമെന്ത് ?
26. 'ഒന്നിനയച്ചാലകമമാത്രം
വന്നു പറഞ്ഞീടുകിലതു പോരും'
- ആരുടെ വാക്കുകൾ ? വ്യക്തമാക്കുക.

(8 × 2 = 16 Marks)

- III. ഓരോന്നിനും ഒന്നരപ്പുറത്തിൽ കവിയാതെ ആറു ചോദ്യത്തിന് ഉത്തരമെഴുതുക.
27. ഗൃഹിണീധർമ്മത്തെപ്പറ്റി കണ്യമഹർഷി ശകുന്തളയ്ക്കു നൽകുന്ന ഉപദേശമെന്ത്?
28. 'ഗുണവുമനവധി ദോഷമായിതു' - ആരുടെ വാക്കുകൾ ? സാരസ്യമെന്ത് ?
29. ശാകുന്തളത്തിലെ അനസൂയയും പ്രിയംവദയും സ്വഭാവം കൊണ്ട് വ്യത്യസ്തരാകുന്നതെങ്ങനെ ?
30. 'സബർമതി ദൂരെയാണ്. നവഖലിയാണ് സമീപം. നവഖലി !' - സന്ദർഭം എഴുതുക.
31. 'പുകകൊണ്ടുകണ്ണുമാറഞ്ഞിരുന്നുവെങ്കിലും ഹോതാവ് ഹോമിച്ചത് ഭാഗ്യവശാൽ അഗ്നിയിൽത്തന്നെ പതിച്ചു' വക്താവാരാണ് ? വിവക്ഷിതമെന്ത് ?
32. 'നല്ലതു നല്ലതിനോടേ ചേരണം' - സന്ദർഭവും സ്വാരസ്യവും വെളിപ്പെടുത്തുക.
33. കൃഷ്ണതമ്പുവെന്ന കഥാപാത്രം 'രാവുണ്ണി' നാടകത്തിൽ വഹിക്കുന്ന പങ്കെന്ത് ?
34. 'മാറ്റാരിൽ കനിവേറ്റമതുളൊരു
കുറ്റാരേക്കാൾ മാറ്റാർ നല്ല'
- ദുര്യോധനൻ ഇങ്ങനെ പറയാൻ കാരണമെന്ത് ?
35. ഉത്തമദ്യുതനെന്ന നിലയിൽ ഹംസത്തിന്റെ സ്വഭാവം നിരൂപിക്കുക.

36. 'ആ ഇക്കണ്ട നെലത്തിന് ഇങ്ങനെ എത്രയത്ര കഥ പറയാൻ കാണും.' - രാവുണ്ണി ഇങ്ങനെ പറയാൻ കാരണമെന്ത്?
37. പാണ്ഡവരുടെ വനജീവിതത്തെക്കുറിച്ചറിയാൻ ദുര്യോധനൻ അയച്ച ദൂതൻ തിരികെയെത്തി പറഞ്ഞ കാര്യങ്ങളെന്തെല്ലാം?
38. ചലച്ചിത്രനിർമ്മിതിയിൽ തിരക്കഥ വഹിക്കുന്ന പങ്കെന്ത്?

(6 × 4 = 24 Marks)

IV. മൂന്നു പുറത്തിൽ കവിയാതെ രണ്ടു ചോദ്യത്തിന് ഉത്തരം എഴുതുക.

39. നളചരിതം ആട്ടക്കഥയുടെ ഭാഷാപരവും സാഹിത്യപരവുമായ സവിശേഷതകൾ വ്യക്തമാക്കുക.
40. ഘോഷയാത്രയെ ആധാരമാക്കി നമ്പ്യാർക്കവിതയുടെ സവിശേഷതകൾ വിശദമാക്കുക.
41. ശാകുന്തളത്തിലെ നാലാമങ്കത്തിന്റെ പ്രാധാന്യത്തെക്കുറിച്ച് ഉപന്യസിക്കുക.
42. രാവുണ്ണി നാടകത്തെ ആധാരമാക്കി, പി.എം. താജിന്റെ നാടകസങ്കല്പത്തെക്കുറിച്ച് പ്രതിപാദിക്കുക.
43. 'ബൈസിക്സിൾ തീവ്സ്' സിനിമയിൽ അവതരിപ്പിക്കുന്ന യാഥാർത്ഥ്യങ്ങളുടെ ആഴം വെളിപ്പെടുത്തുക.
44. ഗാന്ധിയൻദർശനങ്ങളുടെ ആവിഷ്കാരം 'സബർമതി ദൂരെയാണ്' നാടകത്തിൽ നിർവ്വഹിക്കപ്പെടുന്നതെങ്ങനെ?

(2 × 15 = 30 Marks)

(Pages : 4)

K – 2422

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, March 2021.

First Degree Programme under CBCSS

Statistics

Complementary Course for Mathematics

ST 1331.1 – STATISTICAL DISTRIBUTIONS

(2019 Admission Regular)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each question carries 1 mark :

1. What is the mean and variance of a Binomial random variable with $n=10$ and $p=0.2$.
2. What is characteristic function. Write down the characteristic function of a Poisson distribution.
3. Write down the pmf of Geometric distribution.
4. Which continuous distribution has lack of memory property?
5. What is the use of MGF?
6. Give the mean and variance of Gamma distribution.
7. State WLLN.

P.T.O.

8. What is the limiting distribution in Central limit theorem?
9. Define raw moment.
10. Characteristic function always exist. True or False?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Define Hypergeometric distribution.
12. Obtain the mean and variance of Exponential distribution?
13. If $X \sim N(0,1)$, what is $P(X < 1.96)$?
14. What is the cdf of a Exponential distributions?
15. Prove the additive property of Binomial distributions.
16. Obtain the expression for central moment in terms of raw moments.
17. State and prove Bernoulli Law of Large numbers.
18. Show that for iid random variables, sample mean converges in probability to population mean.
19. What is Chebyshev's inequality?
20. If X is a Normal random variable with mean 2 and variance 2. Find $P(|X_n - 2| > \sqrt{21.96})$.
21. What is the pdf of Standard Normal distribution. Give mean and variance.
22. If X is a random variable with distribution function $F(x)$, what are the properties of $F(x)$.
23. Obtain the moment generating function of Exponential distribution.

24. What are the first and second raw moment of Hyper-geometric distribution?
25. Show that sum of Exponential distribution follows Gamma distribution.
26. X follows $N(0,1)$, Find the distribution of $Y = \frac{x-5}{2}$.

(8 × 2 = 16 Marks)

SECTION – C

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

27. Derive variance of Normal distribution.
28. Find mean and variance of Poisson distribution using MGF
29. Derive the distribution of sum of two Normal distribution.
30. Find the mode of the Normal distribution.
31. Explain the fitting of Binomial distributions.
32. Find the coefficient of variation of a Exponential distribution.
33. If X is a continuous random variable with pdf $f(x) = \begin{cases} 3e^{-3x}, & x > 0 \\ 0, & \text{elsewhere} \end{cases}$, then $P(X < 3) = \underline{\hspace{2cm}}$
34. If $X \sim \text{Poisson}(6)$, then find the distribution of $X + a$
35. State and prove memory less property of Exponential distribution.
36. Obtain the Poisson distribution as a limiting form of Binomial distribution.
37. Find the mean and variance of Beta distribution of first kind.
38. If $\{X_i\}$ is a sequence of i.i.d random variables with mean 0 and variance 1. Show that sample mean converges in probability to 0.

(6 × 4 = 24 Marks)

SECTION – D

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

39. Fit the Poisson distribution for the following data.

X	0	1	2	3	4	5	6	7
Frequency	7	6	19	35	30	23	7	1

40. Show that Binomial distribution converges to Normal distribution.

41. (a) Prove the additive property of Gamma distribution.

(b) Derive the first two central moments of Normal distribution using MGF.

42. (a) What is the probability of obtaining more than 1499 heads in 1500 tosses of a fair coin.

(b) Derive the mgf of Binomial distribution and hence obtain the first three central moments.

43. (a) Show that sum and difference of two Normal random variables are Normal.

(b) Obtain the mean and variance of Geometric distribution.

44. (a) Define Uniform distribution. Derive the mean and variance.

(b) Derive the recurrence relation for probabilities of Binomial distribution.

(2 × 15 = 30 Marks)