Reg. No. : ....

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Fourth Semester B.Sc. Degree Examination, August 2022

Career Related First Degree Programme under CBCSS

Physics with Computer Applications

Core Course

PC 1442 : OPTICS

(2019 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

Answer all questions; **each carries 1 mark.**

1. State the superposition principle.

2. What are coherent sources?

3. Define bandwidth.

4. What is Rayleigh's criterion for resolution?

5. State and explain grating law.

6. State Brewster's law.

7. What is the principle of optical fibre?

8. What is meant by population inversion?

Give an example for positive and negative crystals.

Write Cauchy's dispersion formula.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B

swer any **eight**; **each** carries **2** marks.

Define temporal and spatial coherence.

What are the conditions of obtaining constructive and destructive interference?

Explain the phenomenon of color of thin films.

How will you determine the refractive index of a liquid using Newton's rings?

How will you test the optical flatness of a glass?

Write two applications of Michelson interferometer.

What are Fresnel's half period zones? Why are they called so?

Distinguish between e-rays and o-rays.

Explain how circularly polarised light can be produced.

What is double refraction?

What is a quarter wave plate? What is its use?

Give two characteristics of LASER beam.

Which are the components of a LASER?

Discuss the advantages of fibre optic communication system.

What is numerical aperture of an optical fibre?

What is the difference between a step index fibre and graded index fibre.

<div align="right">(8 × 2 = 16 Marks)</div>

Answer any six; each carries 4 marks.

27. Green light of wavelength 5100 A° from a narrow slit is incident on a double slit. If the overall separation of 10 fringes on a screen 200 cm away is 2 cm, find the slit separation?

28. A soap film 5×10^{-5} cm thick is viewed at an angle of 35° to the normal. Find the wavelength of light in the visible spectrum, which will be absent from the reflected light, $\mu = 1.33$.

29. The diameter of the nth ring changes from 1.2 cm to 1.04 cm when the airspace between the lens and the plate is replaced by a liquid. Find refractive index of the liquid.

30. If the grating element is 2×10^{-6} cm. How many order of spectrum are possible for a light of wavelength 650 nm?

31. What is the radius of sixth zone in a zone plate of focal length 10 cm, for a light of wavelength 6000 A°.

32. A plane transmission grating has 14000 lines to an inch for a length of 6 inches. If the wavelength region is 5×10^{-5} cm, find the resolving power of the grating in the first order and the smallest wavelength difference that can be resolved?

33. Calculate the thickness of ice capable of inverting a circularly polarised light. $\mu_o = 1.309$, $\mu_e = 1.313$, wavelength of light = 590 nm.

34. When sunlight is incident on water surface at a glancing angle of 37°, the reflected light is found to be completely plane polarised. Determine the refractive index of water and angle of refraction.

35. The polarizer and the analyser are crossed. Through what angle should the analyser be rotate so that 25% of the light passes through the analyser?

36. Derive the relation between Einstein's coefficients.

37. The energy level difference between two laser level is 0.21eV. Determine the wavelength of radiation.

38. Calculate the numerical aperture and acceptance angle of a fibre having core refractive index = 1.55 and cladding refractive index = 1.50.

(6 × 4 = 24 Marks)

SECTION – D

Answer any **two**; **each** carries **15** marks.

39. Explain the formation of Newton's rings. How can these be used to determine the wavelength of monochromatic light?

40. Describe Michelsons interferometer. How will you determine the wavelength of monochromatic light with the help of Michelsons interferometer.

41. Discuss in detail Fraunhofer diffraction due to a single slit. Derive an expression for the width of central maximum.

42. Explain double refraction. Explain the working of Nicol prism. Give Huygens theory of double refraction.

43. Explain with theory the production of circularly and elliptically polarised light waves.

44. Explain the principle, construction and working of a He-Ne laser.

$(2 \times 15 = 30$ **Marks)**

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Fourth Semester B.C.A./B.Sc. Degree Examination, August 2022

Career Related First Degree Programme Under CBCSS

Group 2(b)/Group 2(a) – Computer Applications / Physics and Computer Applications

Core Course/Vocational Course

CP 1441/PC 1471 – SOFTWARE ENGINEERING

(2019 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A (Very Short Answer Type)

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

1. Define Software engineering.

2. What do you mean by customized software?

3. Differentiate between Classical Waterfall model and Iterative waterfall model.

4. What is the goal of software project management?

5. Define complete COCOMO.

6. Define functional independence among modules.

7. What is stamp coupling?

8. Define top down decomposition approach.

9. Define Test case.

10. CORBA stands for ——————.

<div align="right">(10 × 1 = 10 Marks)</div>

SECTION – B (Short Answer)

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

11. Differentiate program and product.

12. What do you mean by control flow based design?

13. Define technical feasibility.

14. What do you mean by Software Development Methodology?

15. List the complexities in software project management.

16. What is empirical estimation technique?

17. Elaborate modifiable and verifiable in terms of SRS?

18. What do you mean by Function Point Metric?

19. Write a short note on characteristics of good design.

20. What do you mean by Modularity?

21. Differentiate Coincidental Cohesion and Temporal Cohesion.

22. Write a note on menu-based interface.

23. Define System testing?

24. What do you mean software reverse engineering?

25. Write a note on software as a service?

26. Write the disadvantages of client-server architecture.

<div align="right">(8 × 2 = 16 Marks)</div>

SECTION – C (Short Essay)

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

27. Write a note on shortcomings of water fall model.

28. Discuss prototype model in detail.

29. Write in detail about Evolutionary Model

30. Describe project planning in detail..

31. Discuss COCOMO model.

32. Discuss various requirement gathering techniques.

33. Differentiate Control and Content Coupling.

34. Discuss Structured Analysis in detail.

35. Write a note on transformation of DFD Model into structure chart.

36. Write in detail about Code review.

37. Describe in detail about software quality.

38. Write a note on two tier client server architecture.

(6 × 4 = 24 Marks)

SECTION – D

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

39. Describe Agile development models in detail.

40. Discuss the Function Oriented in detail.

41. Explain different project estimation techniques in detail..

42. Write in detailed note on black box testing.

43. Write a detailed note on spiral model.

44. Discuss in detail about Software Reliability.

(2 × 15 = 30 Marks)

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Fourth Semester B.Sc. Degree Examination, August 2022

Career Related First Degree Programme under CBCSS

Physics with Computer Applications

Core Course

PC 1441 : CLASSICAL MECHANICS AND THEORY OF RELATIVITY

(2019 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

Answer all the questions in one or two sentences. Each question carries 1 mark.

1. What is conservative force?

2. Define inverse square law of force.

3. What is meant by centre of mass coordinate system?

4. Define constraints.

5. What are generalised coordinates?

6. What is Coriolis force?

7. Write the principle of equivalence.

8. What is meant by inertial frame of reference?

9. Define frame of reference.

10. State the postulates of special theory of relativity

SECTION – B

Answer any **eight** questions not exceeding a paragraph. Each question carries **2 marks**.

11. Explain the law of conservation of energy.

12. Prove the angular momentum of a particle moving under the action of a central force remains constant.

13. What are central forces? Give an example.

14. State the significance of negative result of Michelson – Morly experiment.

15. Distinguish between conservative and dissipative forces.

16. Explain fictitious forces and centrifugal forces.

17. Explain time dilation.

18. Distinguish between holonomic and nonholonomic constraints

19. Explain principle of virtual work.

20. Explain D'Alembert's principle.

21. Explain the Galilean transformation for coordinates.

22. Explain concept of space.

23. Give mass- energy relation and discuss its significance? What is rest mass energy?

24. Write down Lorentz transformation equations.

25. Explain variation of mass with velocity.

26. Explain twin paradox.

SECTION – C $\qquad$ **(8 × 2 = 16 Marks)**

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

27. Find Lagrange's equation of motion of a simple pendulum.

28. Masses of 4, 3 and 1 kg are located at positions $3j+2t^2k, 3ti-3k$ and $4ti+t^2j$ respectively. Find the position of the centre of mass and the angular momentum of the system about the origin at t = 2s.

29. Derive the expression for variation of mass with velocity.

30. Derive the equations for the simple pendulum using the Lagrange equation.

31. State and prove work energy theorem.

32. State and prove law of conservation of linear momentum.

33. Show that velocity of light is invariant under Lorentz transformation.

34. Compare Lagrangian approach over Newtonian approach.

35. Calculate the kinetic energy of an electron, moving with velocity of 0.98 c in the laboratory frame. (Rest mass of electron $=9.11\times10-31$kg)

36. The length of the moving rod is measured to be exactly half its proper length. What is the speed of the rod, relative to the observer at rest?

37. How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest?

38. At what speed is a particle moving if the mass is equal to three times its rest mass.

<div align="right">

(6 × 4 = 24 Marks)

</div>

SECTION – D

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

39. Derive the differential equation for the orbit of a particle moving under central force.

40. Obtain the Lagrange's equations of motion using D' Alembert's principle for holonomic system.

41. Explain the Kepler's problem of planetary motion and hence deduce it.

42. Obtain the period of oscillation of a compound pendulum using Lagrange's equation.

43. Describe with relevant theory explain Michelson's Morly experiment.

44. Derive Lorentz transformation equations. Show that for small values of velocity, Lorentz co-ordinate transformations reduce to Galilean transformations

(2 × 15 = 30 Marks)

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Fourth Semester B.A./B.Sc. Degree Examination, August 2022

First Degree Programme Under CBCSS

Language Course - English

EN 1411.1/EN 1411.3 : READINGS IN LITERATURE

(Common for Career Related 2(a) courses)

(2019 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

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

1.   What was the context for writing "Song to the men of England"?

2.   Where was the poem "The Gift Outright" first recited?

3.   What does Oodgeroo Noonuccal mean by 'Dream Time'?

4.   In which language was the poem "Agony" first written? Who translated it into English?

5.   Where is the tale "The Power of Faith" taken from?

6.   Why did Jerome go to the British Museum?

7.   What does "The end of Imagination" critique?

8.   Where does the play *A Marriage Proposal* begin?

9. Who wrote *The Cherry Orchard?*

10. What did Uma write in the pages of the family almanacs?

(10 × 1 = 10 Marks)

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

11. Explain the phrase 'salvation in surrender.'

12. What is the theme of the poem "I Can't Help Blossoming?"

13. How does the poem "Agony" describe the physical features of the old woman?

14. Discuss the memories of home in "House of a Thousand Doors."

15. What does Kochuraman decide to learn?

16. How did marriage a effect Uma's education?

17. Who is Pyarimohan?

18. Analyse the title "The Power of Faith."

19. Explain the term 'pro-nuke elite.'

20. Who is Earl Little?

21. Who was Babu Kuruvila?

22. Describe Lomov's and Natalia's first quarrel.

23. Explain 'Ku Klux Klan'.

24. What is the social evils that Tagore critiques in his story 'The Exercise Book'?

25. How does the play *A Marriage Proposal* end?

26. What is Corroboree?

(8 × 2 = 16 Marks)

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

27. Discuss the humour in "Telephone Conversation."

28. Why cannot the Classia flower help blossoming?

29. What are the similarities Atwood draws between the exterior and interior landscapes?

30. Comment on the title 'Madness.'

31. Analyse the significance of the Exercise Book in Tagore's story.

32. Describe the character of Natalia.

33. What role does Tschubukov play in *A Marriage Proposal?*

34. Comment on the relationship between the girl and the narrator in "Identity Card."

35. How did Kochuraman become a wealthy man?

36. Bring out the humour in the story "The Man Who was a Hospital".

37. What will be the impact of nuclear war on environment?

38. How does the social agency displace the family of Malcom?

(6 × 4 = 24 Marks)

IV. Answer any **two** in about **300** words:

39. Discuss the poem "We Are Going "as an aboriginal perspective on colonization.

40. What is the message that the poem "I Can't Help Blooming"? – Convey.

41. Attempt a character sketch of Krishnan in "Madness."

42. Bring out the humour in "The Power of Faith."

43. Comment on Arundathi Roy's views on the Theory of Deterrence.

44. How does Chekov satirize the Contemporary attitude of society to marriage through "*A Marriage Proposal*"?

(2 × 15 = 30 Marks)

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Fourth Semester B.Sc. Degree Examination, August 2022

Career Related First Degree Programme under CBCSS

Complementary Course for Physics and Computer Applications

MM 1431.6 : MATHEMATICS-IV-ABSTRACT ALGEBRA, LAPLACE TRANSFORMS, SPECIAL FUNCTIONS AND FUNCTIONS OF A COMPLEX VARIABLE

(2019 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – I

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

1. Is the set of all non-negative integers (including 0) a group under addition? Justify your answer.

2. State whether TRUE or FALSE: An element in a group may have more than one inverse.

3. Give the generators of the cyclic group $\mathbb{Z}$ under addition.

4. Write the Laplace transform of $\sin kt$.

5. Write the inverse Laplace transform of $\dfrac{s}{s^2 - k^2}$.

6. $\displaystyle\int_0^\infty x^n e^{-x} dx = ?$

7. Give the recursion relation for gamma function.

8. Define beta function.

9. Find the real and imaginary parts of e^{-z}.

10. Define singular point of a complex function.

SECTION – II

Answer any **8** questions. They carry **2** marks each.

11. Define subgroup of a group.

12. Show that the identity e in a group is unique.

13. Define a field.

14. Define zero divisors in a ring.

15. Find the Laplace transform of $\sin^3 2t$.

16. Find $L[e^{at} \cosh bt]$.

17. Find $L^{-1}\left[\dfrac{3(s^2 - 2)^2}{2s^5}\right]$.

18. If $L[f(t)] = F(s)$, prove that $L[e^{at}f(t)] = F(s - a)$.

19. Find $\dfrac{\Gamma\left(\dfrac{2}{5}\right)}{\Gamma\left(\dfrac{12}{5}\right)}$.

20. Evaluate $\Gamma\left(\dfrac{-3}{2}\right)$ in terms of $\sqrt{\pi}$.

21. Prove that $B(p, q) = B(q, p)$.

22. Evaluate $\displaystyle\int_0^\infty \dfrac{y^2 dx}{(1 + y)^6}$

23. State Cauchy-Riemann Equations.

24. Define holomorphic function.

25. Define conjugate harmonic functions.

26. State Cauchy's integral formula.

SECTION – III

Answer any 6 questions. They carry 4 marks each.

27. Show that the subset S of $M_n(\mathcal{R})$ consisting of all invertible $n \times n$ matrices under matrix multiplication is a non-abelian group.

28. Show that if G is a group with binary operation *, then the right cancellation law holds in G.

29. Prove that every field is an integral domain.

30. Find $L\left[e^{4t} \sin 2t \cos t\right]$.

31. Find $L\left[te^{-t} \cosh t\right]$.

32. Find $L\left[\dfrac{1 - \cos 2t}{t}\right]$.

33. Prove $\Gamma\left(\dfrac{1}{2}\right) = \sqrt{\pi}$.

34. Express $\displaystyle\int_0^{\frac{\pi}{2}} \sqrt{\sin^5 x \cos^3 x}\,dx$ in terms of gamma function.

35. Express $\displaystyle\int_0^1 \dfrac{dx}{\sqrt{1 - x^3}}$ in terms of beta function.

36. Using Cauchy Riemann equations, check whether $\dfrac{-x - iy}{x^2 + y^2}$ is analytic.

37. Evaluate $\displaystyle\oint_C \dfrac{\sin 2z\,dz}{6z - \pi}$, where C is $|z| = 3$.

38. Find the residues $R\left(-\dfrac{3}{4}\right)$ and $R(2)$ for the function $f(z) = \dfrac{z}{(4z + 3)(2 - z)}$

SECTION – IV

Answer any **2** questions. They carry **15** marks each.

39. (a) Verify that the set of non-zero rationals, $Q - \{0\}$, is a group under the usual multiplication.

    (b) Show that a subgroup of a cyclic group is cyclic.

40. (a) Show that $\langle \mathcal{R}, +, . \rangle$ is a ring.

    (b) Evaluate $L^{-1}\left[\dfrac{3s + 7}{s^2 - 2s - 3}\right]$.

41. (a) Evaluate $L\left[t^2 u(t - 3)\right]$.

    (b) Using Convolution Theorem, evaluate $L^{-1}\left[\dfrac{1}{s(s^2 + 4)}\right]$

42. (a) Evaluate $\displaystyle\int_0^\infty y^7 e^{-y^2} dy$.

    (b) Prove that $B(p,q) = 2\displaystyle\int_0^{\frac{\pi}{2}} (\sin \theta)^{2p-1}(\cos \theta)^{2q-1} d\theta$.

43. (a) Using residue theorem, evaluate $\displaystyle\oint_C \dfrac{dz}{z^2(z-1)}$ where C is $|z| = 2$.

    (b) Find the Laurent's series expansion of $\dfrac{z}{(z + 1)(z + 2)}$ in $0 < |z + 2| < 1$.

44. (a) Using contour integration, evaluate $\displaystyle\int_0^{2\pi} \dfrac{d\theta}{5 + 4\cos \theta}$.

    (b) Using contour integration, evaluate $\displaystyle\int_0^\infty \dfrac{dx}{1 + x^4}$.

(2 × 15 = 30 Marks)

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Fourth Semester B.Sc. Degree Examination, August 2022

Career Related First Degree Programme under CBCSS

Group 2(a) — Physics and Computer Applications

Vocational Course

PC 1472 — OBJECT ORIENTED PROGRAMMING USING C++

(2019 Admission Onwards)

Time : 3 Hours   Max. Marks : 80

SECTION – A

(Very Short Answer)

(One word to maximum of **two** sentences. Answer all questions).

1.   What is the use of write ( )?

2.   What does set precision mean in C++?

3.   What does open ( ) do in C++?

4.   Who developed C++?

5.   What is polymorphism?

6.   Explain pure virtual function.

7.   Explain the term prototype.

8.   What is cout?

9.   Explain the function of seekp( ).

10. Which C++ Oops feature is related to reusability?

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

(Short Answer Type)

Not exceeding **one** paragraph. Answer any **eight** questions. Each question carries **2 marks**.

11. How do you implement encapsulation in C++?

12. Explain if-else statement.

13. Write short note on friend class.

14. Explain procedural oriented language.

15. What are extraction and insertion operators in C++?

16. Explain the use of break statement.

17. What is default constructor? Write its syntax.

18. Explain new operator.

19. What is type conversion?

20. What is the syntax of class declaration?

21. What is Object slicing?

22. Write a note on early binding.

23. What is abstract class?

24. List the operators that cannot be overloaded.

25. What are the characteristics of a destructor?

26. What are access specifiers?

(8 × 2 = 16 Marks)

SECTION – C

(Short Essay Type)

Not exceeding **120** words. Answer any **six** questions. Each question carries **4** marks.

27. Draw a neat diagram of the hierarchy of stream classes for I/Operations.
28. Explain difference between while and do while statement with suitable example.
29. Write note on tellg( ) and tellp( ).
30. What are inline function?
31. Explain call by reference with an example.
32. Write note on static member function.
33. Write a program to implement unary operator overloading using friend function.
34. What are macros? Give an example.
35. Write note on benefits and applications of OOPs.
36. Explain virtual base classes.
37. Explain try and catch statements with an example.
38. Explain any three file modes briefly.

(6 × 4 = 24 Marks)

SECTION – D

(Long Essay Type)

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

39. Explain loops in C++ with suitable example.
40. Explain the characteristics of a constructor. Explain its types with example.
41. Explain binary operator overloading with an example program.
42. How run time polymorphism is implemented in C++? Explain with an example.
43. Explain formatted I/O operations in C++.
44. What is inheritance? Explain its types.

(2 × 15 = 30 Marks)