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R – 2529

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, July 2023

Career Related First Degree Programme under CBCSS

Mathematics

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

Answer **all** questions. They carry 1 mark each.

1. State true or false: A group may have more than one identity element.
2. Define a cyclic group.
3. Define a field.
4. Find $L[e^{-3t} \cos 2t]$.
5. Find the inverse Laplace transform of $\frac{s}{s^2 + 1}$.
6. Write $L\{f''(t)\}$ in terms of $L(f)$, $f(0)$ and $f'(0)$.

P.T.O.

7. Find the singular points of the function $\frac{z-1}{z^2+2z}$.
8. Show that $\int_C \frac{z^i}{z-3} dz = 0$ where C is the circle $|z|=2$.
9. Define Gamma function Γn .
10. Find $\beta(1,1)$

(10 × 1 = 10 Marks)

SECTION – II

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

11. Is Z^+ a group under addition? Justify
12. State the left and right cancellation laws in a group.
13. Prove that every cyclic group is abelian.
14. Find the Laplace transform of $f(t) = t \cos 4t$.
15. Find the Laplace transform of $f(t) = \cos 3t \cos 2t$.
16. Find $L[e^{-3t} \cos 2t]$.
17. Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$.
18. State the convolution theorem for Laplace transforms.
19. Find the constants a, b, c if the function $f(z) = x + ay + i(bx + cy)$ is analytic.
20. Verify Cauchy's theorem for the function $f(z) = z^2$ and C is the circle $|z|=1$.

21. Express $\int_0^{\infty} e^{-x^3} dx$ as a gamma function.

22. Show that $\beta(m, n) = \beta(n, m)$.

(8 × 2 = 16 Marks)

SECTION – III

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

23. If H and K are subgroups of a group G , prove that $H \cap K$ is also a group

24. Show that although Z_2 is an integral domain, the matrix ring $M_2(Z_2)$ has zero divisors.

25. Find the Laplace transform of the function $f(t) = \begin{cases} t & t \geq 2 \\ 0 & t < 2 \end{cases}$.

26. Find the Laplace transform of $\int_0^t t e^{-4t} \sin 3t dt$.

27. Solve $y'' + y' - 6y = 0$, $y(0) = 1$, $y'(0) = 1$.

28. Check whether $u(x, y) = x^3 - 3xy^2 + 3x^2 - 3y^2 + 1$ is harmonic.

29. Expand $f(z) = \frac{1}{(z+1)(z+3)}$ in Laurent's series valid for $1 < |z| < 3$.

30. Show that $\beta(p, 1-p) = \frac{\pi}{\sin(p\pi)}$.

31. Show that $\Gamma(n) = \int_0^1 \left(\log \frac{1}{x}\right)^{n-1} dx$.

(6 × 4 = 24 Marks)

SECTION – IV

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

32. (a) Prove that a non-empty subset H of a group G is a subgroup of G if and only if

(i) H is closed under the binary operation of G

(ii) The identity element e of G is in H ,

(iii) For all $a \in H$ it is true that $a^{-1} \in H$

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

33. (a) If $L[f(t)] = F(s)$ show that $L[f(t-a)u(t-a)] = e^{-as}F(s)$.

(b) Solve $y''+3y'+2y = r(t) = u(t-1) - u(t-2)$, $y(0) = 0, y'(0) = 0$.

34. (a) Use Cauchy's residue theorem to evaluate $\int_C \frac{z^2}{(z-1)^2(z+2)} dz$ where $C: |z| = 3$.

(b) Evaluate $\int_0^{2\pi} \frac{d\theta}{5 + 4 \cos \theta}$.

35. (a) Prove the relation between Beta and Gamma function: $\beta(p, q) = \frac{\Gamma p \Gamma q}{\Gamma(p+q)}$.

(b) Express the integral $\int_0^\infty \frac{y^{n-1} dy}{(1+y)^{m+n}}$ in terms of Beta function.

(2 × 15 = 30 Marks)

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R – 2520

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, July 2023

Career Related First Degree Programme Under CBCSS

Physics with Computer Applications

Core Course

PC 1441 : CLASSICAL MECHANICS AND THEORY OF RELATIVITY

(2015 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all the questions. Each question carries 1 mark.

1. What is a central force?
2. What is meant by virtual work?
3. What are generalized coordinates?
4. What are constraints?
5. Explain inertial frames
6. What are Galilean transformation?
7. What is space like interval?
8. What are tachyons?

P.T.O.

9. Explain the term Q-factor
10. What is twin paradox?

(10 × 1 = 10 Marks)

SECTION – B

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

11. Prove that total energy of a harmonic oscillator is equal to its maximum kinetic energy.
12. State Newton's laws of motion.
13. Explain the features of a simple harmonic motion.
14. Explain the term power dissipation.
15. Give the examples of non-holonomic constraints.
16. What are cyclic coordinates?
17. Explain the origin of fictitious forces in uniform rotational motion.
18. Explain co-ordinate transformation within a reference frame.
19. What was the aim of Michelson-Morley experiment?
20. What is Coriolis force?
21. What is Lorentz-Fitzgerald contraction?
22. What is proper time? Explain.

(8 × 2 = 16 Marks)

SECTION – C

Answer any six questions. Each question carries 4 marks.

23. Find the work done in moving a particle from (0,0,0) to (2,3,4) along a straight-line path by the force $\vec{f} = 4\vec{i} - 5\vec{j} - 8\vec{k}$
24. The maximum velocity of a particle executing SHM is 1 m/s and period is 1/5 seconds. Find the amplitude and maximum acceleration.
25. Calculate the reduced mass of HCl molecule. Given the mass of Hydrogen is 1 amu and that of Chlorine is 35.5 amu.
26. Find the Hamiltonian for an ideal spring-mass arrangement.
27. Two masses of 9 gm and 4 gm have equal kinetic energies. Find the ratio of their momenta.
28. A rocket is moving upwards with an acceleration 3g. Find the effective weight of an astronaut in the rocket when his actual weight is 75 kg.
29. A person in a jet plane is flying along the equator with a speed of 450 m/s. What is the Coriolis acceleration?
30. A metre scale is moving along its length with a velocity 0.7c. What will be its length as it appears to an observer
(a) on the earth (b) moving with the scale itself.
31. At what speed a particle should move so that its mass is equal to three times its rest mass.

(6 × 4 = 24 Marks)

SECTION – D

Answer any two questions. Each question carries 15 marks.

32. Give the principle of a symmetric bar pendulum. Describe an experiment to find the value of g at a place using a symmetric bar pendulum.
33. State the postulates of special theory of relativity. Derive the Lorentz transformation equations for inertial frames.

34. Derive the Lagrange's equations for a simple pendulum.
35. Assuming the formula for variation of mass with velocity derive the mass energy relation $E = mc^2$

(2 × 15 = 30 Marks)

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R – 2522

Reg. No. :

Name :

Fourth Semester B.Sc. Degree Examination, July 2023

Career Related First Degree Programme under CBCSS

Physics With Computer Applications

Core Course

PC 1442 : OPTICS

(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

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

1. State and explain Brewster's law
2. Give any two differences between a zone plate and a convex lens.
3. State the conditions for interference of light from two light sources.
4. Explain the terms —
 - (i) population inversion
 - (ii) metastable state
5. Describe the bandwidth of interference pattern in the double slit experiment.

P.T.O.

6. Explain normal dispersion
7. Write down the expression for the resolving power of a telescope and a microscope.
8. Explain Malus' law.
9. Write any two differences between a single mode optical fibre and a multimode optical fibre.
10. What is pumping? Give two examples of pumping mechanisms.

(10 × 1 = 10 Marks)

SECTION – B

Answer any 8 questions. Each carries 2 marks.

11. What are the main differences between prism spectrum and grating spectrum?
12. Explain Rayleigh criterion for resolution.
13. Differentiate between e-ray and o-ray in a doubly refracting material.
14. Explain the working of a quarter wave plate.
15. Describe pulse dispersion in optical fibres.
16. Compare spontaneous and stimulated emission of light.
17. Describe the production of circularly polarized light using nicol prism.
18. Explain the formation of colours in oil films spread over water.
19. How is the refractive index of a liquid determined using Newton's rings apparatus?
20. Describe with a block diagram the main parts of a fibre optic communication system.

21. Explain missing order maxima in double slit Fraunhofer diffraction pattern.
22. Draw the experimental setup of air wedge apparatus and explain the parts.

(8 × 2 = 16 Marks)

SECTION – C

Answer Any 6 questions. Each carries 4 marks.

23. An air wedge apparatus of angle 0.01 radian is illuminated by light of wavelength 6000 Angstroms. At what distance from the edge of the wedge will be 10th dark fringe observed?
24. In Newton's rings experiment, the diameter of the 15th ring was found to be 0.59 cm and that of the 5th ring was found to be 0.336 cm. If the radius of the plano-convex lens used is 100 cm. calculate the wavelength of light used.
25. A plane grating has 15000 lines per inch. Find the angle of separation of the 5048 Angstrom and 5016 Angstrom lines of Helium in the second order spectrum.
26. The diameter of the first ring of a zone plate is 1.1 mm. If light of wavelength 6000 Angstrom is incident on the zone plate, where should the screen be placed so that a bright spot is obtained?
27. The critical angle for total internal reflection from water is 48°. find the polarization angle and the angle of refraction corresponding to the polarization angle.
28. Calculate the least thickness of a calcite plate which would convert incident plane polarized light into circularly polarized light. Given $\mu_o = 1.658$, $\mu_e = 1.486$ for calcite and wavelength of light used is 5890 Angstrom.
29. An optical fibre has acceptance angle of 30° and a core of refractive index 1.400. Find the refractive index of the cladding
30. Find the ratio of populations of the two states in a He – Ne Laser system that produces light of wavelength 6328 Angstrom at a temperature of 27°C.

31. Light of intensity I_0 is incident on a polarizer. Find the intensity of the resultant beam if the incident light is plane polarized at an angle of 30° with the axis of the polarizer.

(6 × 4 = 24 Marks)

SECTION – D

Answer any 2 questions. **Each** carries 15 marks.

32. Describe the structure and working of Michelson's interferometer. Explain its use in determination of wavelength of light
33. Explain Fraunhofer diffraction at a double slit. Obtain the intensity distribution and positions of maxima and minima.
34. Explain the use of Nicol prism as polarizer and analyzer. How is it used to produce elliptically produced light?
35. Discuss the construction and working of a ruby laser system

(2 × 15 = 30 Marks)

(Pages : 3)

R – 2143

Reg. No. :

Name :

Fourth Semester B.A./B.Sc. Degree Examination, July 2023

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 in a word or sentence.
1. Who is Krishnankutty by profession?
2. Write the antonym of the word unite.
3. How are the whites described in the poem 'We are going'?
4. How is the old woman in the poem 'Agony' described?
5. In the poem 'The Man who was a Hospital' poet did not have _____ disease.
6. What did the colonists hold back from the land on "The Gift Outright"?
7. Who gifted Uma the exercise book?
8. Who is Lomov in Chekov's play?
9. What is the speaker's confession in the poem 'Telephone Conversation'?
10. How does the poet Ayyapa Panikar exemplify the theme of his poem?

(10 × 1 = 10 Marks)

P.T.O.

II. Answer any **eight** from the following not exceeding **50** words.

11. How is the question of caste brought into the poem 'Identity card' without mentioning much about it?
12. What has the colonizers done to the land of the natives?
13. What were the reasons for Lomov getting married?
14. Which are the diseases the poet felt he suffered from?
15. What is the theme of the Exercise Book by Rabindranath Tagore?
16. Why does the speaker get irritated in the poem 'Telephone Conversation'?
17. How is the golden Cassia described in Panikar's poem?
18. Comment on the title madness.
19. What was Malcolm X's Nightmare?
20. What is the significance to the words "I watch her kneel in all my lifetime" in the poem 'House of a Thousand Doors'?
21. Why did the Residents Association not help John Kurian?
22. Comment on the impact of nuclear war on the environment.

(8 × 2 = 16 Marks)

III. Answer any **six** from the following not exceeding **100** words.

23. Describe the character of Lomov.
24. Consider Telephone Conversation by Wole Soyinka as a fine example of dramatic monologue.
25. Comment on the significance of the exercise book for Uma.
26. How is Krishnan kutty a victim of caste-class alienation?

27. How does Arundhati Roy criticize India's nuclear policies?
28. How does Panikar describe the transition of the golden Cassia?
29. Who is Kochuraman in the short story "The Power of Faith"?
30. How does the poet bring out the aspect of colonization in the poem 'The Gift Outright'?
31. Analyse the title of the essay 'Nightmare'.

(6 × 4 = 24 Marks)

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

32. Arundhati Roy's argument against India's nuclear policy.
33. Discuss the plight of the natives in the poem 'We are going'.
34. Bring out the humour and irony in Chekov's play 'A Marriage Proposal'.
35. Analyse the characters in Ayyapan's short story 'Madness'.

(2 × 15 = 30 Marks)

(Pages : 3)

R – 2666

Reg. No. :

Name :

Fourth Semester B.C.A./B.Sc. Degree Examination, July 2023

Career Related First Degree Programme under CBCSS

Computer Applications / Physics and Computer Applications

CP 1442 / PC 1472 : PYTHON PROGRAMMING

(2021 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer all questions. Each Carries 1 mark.

1. What is datatype conversion?
2. Define enumerate() function.
3. Write the syntax of delete command in Python.
4. What is an iterator in Python?
5. How do you retrieve a cookie in Python?
6. How are exceptions handled in Python?
7. What are some common use cases for regular expressions in Python?
8. What is search() function?
9. Differentiate between mkdir() and chdir().
10. Write the syntax for renaming a file.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B

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

11. What are nested if statements?
12. Differentiate between logical and arithmetic operators.
13. How can HTTP headers be set and modified in Python using the requests library?
14. What is a generator in Python? How is it different from a normal function?
15. What is transaction control in Python, and how is it used to ensure data consistency?
16. When should assertions be used in Python?
17. How are classes defined in Python?
18. How is data hiding achieved in Python?
19. Write a Python function that takes a list of integers as input and returns the sum of all even numbers in the list.
20. How can you create and use your own modules and packages in a Python program?
21. What is the purpose of the 'return' statement in Python functions?
22. Write a short note on list datatype in Python.

(8 × 2 = 16 Marks)

SECTION – C

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

23. Write a short note on string operations
24. Explain input/output functions in Python
25. How can a class be used as a decorator in Python? Provide an example.
26. What is the difference between the GET and POST methods in Python? How are they used in web development?
27. What are the different types of inheritance in Python?
28. How do you implement polymorphism in Python and what are some examples?
29. Explain operator overloading in Python with the help of examples.
30. Briefly explain different types of function arguments.
31. Illustrate date and time modules in detail.

(6 × 4 = 24 Marks)

SECTION – D

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

32. Describe the different types of loops available in Python.
33. Compare and contrast the key features and functionalities of database programming and CGI programming. Discuss the advantages and limitations of each technology in different software development scenarios.
34. Compare and contrast different approaches to exception handling in Python by highlighting their advantages and limitations.
35. Describe the file handling methods in Python.

(2 × 15 = 30 Marks)

(Pages : 3)

R – 2665

Reg. No. :

Name :

Fourth Semester B.C.A/B.Sc. Degree Examination, July 2023

Career Related First Degree Programme Under CBCSS

Computer Applications/Physics and Computer Applications

CP 1441/PC 1471 : SOFTWARE ENGINEERING

(2021 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A (Very Short Answer Type)

Answer all questions. Each question carries 1 mark.

1. What is Decision Tree?
2. Write any two techniques used for ~~Project Planning~~ and Control.
3. What is Software Engineering?
4. Describe purpose of SRS.
5. What is State Chart Diagram?
6. Explain Function Oriented Design.
7. Describe Spiral Model.
8. Write a note on Gantt Chart.
9. Explain PERT.
10. Write a note on Unit Testing.

(10 × 1 = 10 Marks)

P.T.O.

SECTION – B (Short Answer)

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

11. Explain CORBA.
12. What do you know by COCOMO?
13. List the benefits of incremental Model.
14. Write the purpose of Agile Development Models.
15. Explain Water Fall Model.
16. What is the function of Feasibility Study?
17. Explain the overview of design process.
18. Describe Project Estimation Techniques.
19. What are the advantages of Prototyping model?
20. Write a note on Requirements Gathering and Analysis.
21. What is Data Dictionary?
22. Give overview of SA/SD Methodology.

(8 × 2 = 16 Marks)

SECTION – C (Short Essay)

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

23. What do you know about structured Analysis?
24. What is Code review?
25. Explain the concept of Debugging.
26. Differentiate Cohesion and Coupling.
27. Describe Client server Architectures.
28. How do you estimate the cost of a Software?
29. Illustrate evolution and significance of SE.
30. Explain types of Software Development Projects.
31. Briefly explain Software Project Management.

(6 × 4 = 24 Marks)

SECTION – D (Long Essay)

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

32. Illustrate SRS with examples.
33. Describe Class Diagram with suitable examples.
34. Make a comparison of different life cycle models.
35. Illustrate emerging trends in Software Engineering.

(2× 15 = 30 Marks)
