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B – 3157

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, December 2016
Career Related First Degree Programme under CBCSS
Group 2(a) : Complementary Course I for Physics and Computer
Applications

MM 1131.6 : COMPLEX NUMBERS, DIFFERENTIATION AND THEORY
OF EQUATIONS
(2013 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – I

All the first 10 questions are **compulsory**. These questions carry 1 mark each.

1. State De Moivre's theorem.
2. If w is a non-real complex root of unity, what is the value of $1 + w + w^2$?
3. What is the geometrical meaning of the average rate of change of a function $y = f(x)$ with respect to x over the interval $[x_0, x_1]$?
4. State how the graphs of the functions $f(x) = e^x$ and $g(x) = \ln x$ are related ?
5. Define the hyperbolic sine function.
6. Write the Maclaurin's series of e^x .
7. If $z = y^3 - 3xy$, find $\frac{\partial z}{\partial y}$.
8. State Euler's theorem on homogeneous functions.
9. Write a polynomial equation of least degree with integer coefficients having $-1 + i$ as one of its root.
10. State Descartes' rule of signs.

(10×1=10 Marks)



SECTION – II

Answer **any 8** questions from among the questions **11** to **22**. These questions carry **2 marks each**.

11. If $x = \cos\theta + i\sin\theta$ find $x^2 + \frac{1}{x^2}$ and $x^2 - \frac{1}{x^2}$.
12. Expand $\cos 4\theta$ in powers of $\cos\theta$ and $\sin\theta$.
13. Find the graph of the parametric equations $x = \cos t$, $y = \sin t$, $0 \leq t \leq 2\pi$.
14. Find the slope of the graph of $y = x^2 + 1$ at the point $(2, 5)$ and use it to find the equation of the tangent line at this point.
15. State the mean value theorem and give its velocity interpretation.
16. Find $\frac{dy}{dx}$ if $y = \frac{e^x - e^{-x}}{e^x + e^{-x}}$.
17. Find the interval of convergence and radius of convergence of the power series $1 + x + x^2 + \dots$.
18. Find the Taylor series for $\frac{1}{x}$ about $x = 1$.
19. If $z = x^2y$, $x = t^2$, $y = t^3$ find $\frac{dz}{dt}$.
20. If $u = x + y$ and $v = x - y$, find the Jacobian $\frac{\partial(x, y)}{\partial(u, v)}$.
21. Solve the equation $4x^3 - 24x^2 + 23x + 18 = 0$, given that its roots are in arithmetic progression.
22. If α, β, γ are the roots of $x^3 + 3x^2 - 2x - 4 = 0$, find the equation whose roots are $\alpha + 3, \beta + 3, \gamma + 3$.

(8×2=16 Marks)



SECTION - III

Answer **any 6** questions from among the questions **23** to **31**. These questions carry **4 marks each** :

23. Expand $\cos^4\theta \sin^3\theta$ in terms of sines of multiples of θ .
24. Separate $\tan^{-1}(x + iy)$ into real and imaginary parts.
25. Assume that oil spilled from a ruptured tanker spreads in a circular pattern whose radius increases at a constant rate of 2 ft/s. How fast is the area of the spill increasing when the radius of the spill is 60 ft ?
26. Show that the function $f(x) = x^5 + x + 1, -\infty < x < \infty$ is invertible. Show that f^{-1} is differentiable on $(-\infty, \infty)$ and find the derivative of f^{-1} .
27. Find the first three non-zero terms in the Maclaurin's series for $\tan x$.
28. Show that a differentiable function f of the form $z = f(xy)$ satisfies the equation
- $$x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y} = 0.$$
29. Use the method of Lagrange multipliers to find the maximum and minimum values of $f(x, y) = xy$ subject to the constraint $4x^2 + 8y^2 = 16$.
30. If α, β, γ are the roots of the equation $x^3 - x - 1 = 0$, find the equation whose roots are $\frac{1+\alpha}{1-\alpha}, \frac{1+\beta}{1-\beta}, \frac{1+\gamma}{1-\gamma}$. Hence find the value of $\sum \frac{1+\alpha}{1-\alpha}$.
31. Solve the equation $6x^4 - 25x^3 + 37x^2 - 25x + 6 = 0$. **(6x4=24 Marks)**



SECTION - IV

Answer **any 2** questions from among the questions **32 to 35**. These questions carry **15 marks each** :

32. a) Solve the equation $x^9 + x^5 - x^4 - 1 = 0$.
b) If $\cos(x + iy) = \cos \theta + i \sin \theta$, prove that $\cos 2x + \cosh 2y = 2$.
33. a) Find all absolute extreme of the function $f(x) = x^3 - 3x^2 + 4$ on the interval
(i) $(-\infty, \infty)$, (ii) $(0, \infty)$.
b) A garden is to be laid out in a rectangular area and protected by a chicken wire fence. What is the largest possible area of the garden if only 100 running feet of chicken wire is available for the fence.
34. a) Suppose $w = x^2 - y^2 + z^2$ and $x = \rho \sin \phi \cos \theta$, $y = \rho \sin \phi \sin \theta$, $z = \rho \cos \phi$.
Find $\frac{\partial w}{\partial \rho}$ and $\frac{\partial w}{\partial \theta}$.
b) Locate all relative extrema and saddle points of $f(x, y) = 3x^2 - 2xy + y^2 - 8y$.
35. a) Solve by Cardon's method $x^3 - 9x + 28 = 0$.
b) Solve by Ferrari's method $x^4 + 2x^3 - 7x^2 - 8x + 12 = 0$. **(2x15=30 Marks)**
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physics.
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Reg. No. :

Name :

First Semester B.Sc. Degree Examination, December 2016
Career Related FDP under CBCSS
(Computer Science/BCA/Physics and Computer Application)
Course Code : CS 1121/CP 1121/PC 1171
INTRODUCTION TO INFORMATION TECHNOLOGY
(2014 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Very short answer type :

One word to maximum of **one** sentence. Answer **all** questions. **(10×1=10 Marks)**

1. Information means _____ data.
2. _____ consists of instructions that control the computers.
3. Booting means _____
4. Which is the fastest storage element in a computer ?
5. HTTP means _____
6. What are Optical Readers ?
7. Write the name of a Free Operating System.
8. What is an Internet browser ?
9. What is meant by M-commerce ?
10. What is RDRAM ?

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SECTION – B

Short answer :

Not to exceed **one** paragraph. Answer **any eight** questions. **Each** question carries **two** marks. **(8×2=16 Marks)**

11. Is ROM necessary in a computer ? Justify your answer.
12. Differentiate between Application Software and System Software.
13. What are plotters ?
14. What is meant by high level languages ?
15. What is a search engine ? Give an example.
16. State any two characteristics of digital signals.
17. What is flash memory ?
18. Briefly explain computer viruses.
19. Explain a various types of RAM.
20. What are routers ?
21. What are the various memory accessing techniques ?
22. What is meant by open source ?

SECTION – C

Short essay :

Not to exceed **120** words. Answer **any six** questions. **Each** question carries **four** marks. **(6×4=24 Marks)**

23. Discuss the characteristics of computers.
24. Differentiate between main memory and secondary storages.
25. Explain the Von Neumann model of computer system.



26. Write a brief note on WWW ?
27. Discuss the use of LATEX.
28. Explain different types of internet connections.
29. What are super computers ? Give an example.
30. Compare CRT and LCD monitors.
31. Write a note on features of email softwares.

SECTION - D

Long essay :

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

(2×15=30 Marks)

32. Illustrate the application of computers in any five fields.
 33. Write a notes on :
 - a) Internet connections
 - b) Application softwares
 - c) E-mail software features.
 34. Discuss various auxiliary storages.
 35. Discuss the classification of operating system in detail.
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Reg. No. :

Name :

First Semester B.Sc. Degree Examination, January 2016
(Career Related First Degree Programme under CBCSS)
Group 2(a) : PHYSICS AND COMPUTER APPLICATIONS
PC 1121 – Mechanics, Thermodynamics and Properties of Matter
(2015 Admission)

Time : 3 Hours

Max. Marks : 80

SECTION – A

I. Answer **all** questions in a **word** or **one** or **two** sentences. **Each** question carries **one** mark.

- 1) What is a heterogeneous system ?
- 2) Explain variables of state.
- 3) Define entropy.
- 4) Write down the effective way to increase efficiency of Carnot's engine.
- 5) Explain Stefan's law.
- 6) Explain torque.
- 7) What is an I section girder ?
- 8) Define surface tension of a liquid.
- 9) What is radius of gyration ? Explain the factors which effect the radius of gyration.
- 10) State and explain parallel axis theorem. **(10x1=10 Marks)**

SECTION – B

II. Answer **any eight** questions, **not** exceeding a paragraph. **Each** question carries **two** marks.

- 11) Explain the perpendicular axes theorem for a lamina body.
- 12) Deduce Clausius Clapeyron's Latent Heat equation.



- 13) What is equation of state ? Give its limitations.
- 14) Write a short note on entropy and disorder.
- 15) Deduce the MI of a solid cylinder about its own axis.
- 16) What are the factors affecting surface tension ?
- 17) Explain Poisson's ratio.
- 18) Briefly explain the molecular theory of surface tension.
- 19) Write a note on thermal conductivity of rubber.
- 20) Explain the principle of increase of entropy.
- 21) Define isobaric and isochoric process.
- 22) Write a note on reversible and irreversible process. (8×2 = 16 Marks)

SECTION – C

III. Answer **any six** questions. **Each** question carries **four** marks.

- 23) A flywheel of mass 500 kg and 2 metres diameter. makes 500 revolutions per minute. Assuming the mass to be concentrated at the rim, calculate the angular velocity, the energy and the moment of inertia of the fly wheel.
- 24) A fly wheel weighs 10 tons, and the whole of the weight may be considered as concentrated at a distance 3 ft. from the axis. What is the amount of energy stored in the flywheel when rotating speed of 100 revolution per minute ?
- 25) Find the workdone in stretching a wire of cross section 1 sq mm and length 2 metres through 0.1 mm, if Young's modulus for the material of the wire 2×10^{11} N/m².
- 26) A disc of 10 cm radius and mass 1 Kg is suspended in a horizontal plane by vertical wire attached to its center. If the diameter of the wire is 1 mm and its length is 1.5 metres and period of torsional vibration of the disc is 5 sec, find the rigidity modulus of the material of the wire.
- 27) The pressure of air in soap bubble of 0.7 cm diameter is 8 mm of water above the atmospheric pressure. Calculate the surface tension of the soap solution.



- 28) A sphere of water of radius 1 mm is sprayed into a million drops equal size. Find the work expended in doing so.
- 29) A Carnot engine has an efficiency of 50% when its sink temperature is 27 °C. What must be the change in its source temperature so that its efficiency may become 60% ?
- 30) Calculate the change in melting point of ice when it is subjected to a pressure of 100 atmospheres. Density of ice = 0.917g/cm³ and latent heat of ice = 336 J/g.
- 31) The opposite faces of a metal plate of 0.2 cm thickness are at a difference of temperature of 100°C and the area of plate is 200 sq cm. Find the quantity of heat that will flow through the plate in one minute if $K = 0.2$ CGS units.

(6×4 = 24 Marks)

SECTION – D

IV Answer **any two** questions. Each question carries **fifteen** marks.

- 32) Describe an experiment to verify Stefan's Law and the determination of Stefan's constant.
- 33) State and prove Bernoulli's theorem and mention some of its important applications.
- 34) Determine the coefficient of rigidity (n) for a wire using state torsion method.
- 35) Derive the Moment of Inertia for a solid cylinder.

(2×15 = 30 Marks)

PEA



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B – 3256

Reg. No. :

Name :

First Semester B.Sc. Degree Examination, December 2016
Career Related First Degree Programme under CBCSS
PHYSICS WITH COMPUTER APPLICATIONS
Foundation Course I
PC 1121 : Mechanics, Thermodynamics and Properties of Matter
(2015 Admission Onwards)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions. **Each** question carries **one** mark. **(10×1=10 Marks)**

1. Define entropy of a system.
2. State zeroth law of thermodynamics.
3. Write the expression for moment of inertia of a ring about its diameter.
4. Write an expression for efficiency of Carnot engine.
5. What is an adiabatic process ?
6. What is the temperature dependence of energy according to Stefan's law ?
7. Define the term thermal conductivity.
8. What is solar constant ?
9. Define surface energy.
10. Write the equation of continuity.

SECTION – B

Answer **any eight** questions. **Each** question carries **two** marks. **(8×2=16 Marks)**

11. Derive an expression for moment of inertia of a uniform rod about an axis passing through its centre and perpendicular to its length.
12. What is an isothermal process ? Give an example.

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13. State and explain third law of thermodynamics.
14. State and explain Carnot's theorem.
15. Define Stefan's constant. Write its unit.
16. State first law of thermodynamics. Write its differential form.
17. Derive an express for excess pressure inside a spherical drop.
18. Define surface tension. What are the factors affecting surface tension of water ?
19. Write Clausius Clapeyron equation and write one application of it.
20. Write down the effects of pressure on boiling point and melting point.
21. What is bending moment ? Write an equation for it.
22. Derive the equation connecting C_p and C_v for an ideal gas.

SECTION – C

Answer **any six** questions. **Each** question carries **four** marks. **(6×4=24 Marks)**

23. A circular disc of radius 20 cm and mass 1 kg is rotating at the rate of 10 revolutions per second about an axis at right angle to its plane and passing through its centre. Find the work that must be done to increase the rate of revolution to 20 per second.
24. A uniform sphere of mass 2 kg and radius 10 cm is released from rest on an inclined plane which makes 30° angle with the horizontal. Calculate its
 - i) Angular acceleration
 - ii) Linear acceleration along the plane.
25. A steel strip is clamped horizontally from one end. On applying a 0.5 kg load at the free end the bending in equilibrium state is 5 cm. Calculate potential energy of the strip. (neglect the mass of the steel strip).
26. Find the excess pressure inside a spherical soap bubble of radius 2 cm. surface tension = 3×10^{-2} N/m.
27. 1000 droplets of water each of radius 1 mm coalesce to form a single drop. Calculate the change in energy. (surface tension = 7×10^{-2} N/m).



28. The efficiency of a Carnot's engine operated between the source and sink is $\frac{1}{6}$. If on reducing the temperature of the sink by 65°C the efficiency becomes $\frac{1}{3}$. Find the temperature of source and sink.
29. Using Clausius-Clapeyron equation, calculate the change in boiling point of water when the pressure is increased from 1 atm to 1.2 atm. Given specific volume of steam = $1.677\text{ m}^3/\text{Kg}$, latent heat of steam = $2.268 \times 10^6\text{ J/Kg}$. Boiling point of water at 1 atm = 100°C and pressure of 1 atm = $1 \times 10^5\text{ N/m}^2$.
30. The energy emitted by a black body in unit time for unit area at the temperature $T\text{ K}$ is 'E'. What will be the energy if the temperature is $4T\text{ K}$?
31. What is the angular momentum of a particle whose rotational kinetic energy is 20 J. If the angular momentum vector coincides with the axis of rotation and its moment of inertia about the axis is 0.02 Kg m^2 .

SECTION – D

Answer **any 2** questions. Each question carries **fifteen** marks. (2×15=30 Marks)

32. State and explain theorems on moment of inertia.
 33. What is a heat engine ? What are its essential parts ? Describe the working of Carnot's heat engine with the help of indicator diagrams and derive the equation for its efficiency.
 34. Describe the experiment to determine the thermal conductivity of a bad conductor by Lee's disc method.
 35. Define the rigidity modulus. Describe static torsion experiment to determine it.
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