(Pages : 4) **H – 1637**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, October 2019

Career Related First Degree Programme Under CBCSS

Group 2 (a) Complementary Course for Physics and Computer Applications

MM 1331.6 : MATHEMATICS-III — VECTOR DIFFERENTIATION, CO-ORDINATE SYSTEMS, ABSTRACT ALGEBRA AND FOURIER SERIES AND TRANSFORMS

(2013 admission onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

All the first **ten** questions are compulsory. Each question carries 1 marks.

1. If $\vec{v} = x\hat{i} + y\vec{j} + z\hat{k}$, then what is $|\vec{v}|$.

2. If $\vec{v} = 2x\hat{i} + 3y\hat{j} + 4\hat{k}$, find Curl $\vec{v}$.

3. If $\phi = x^2 + yz$, find grad ϕ.

4. What is the expression for cartesian co-ordinates in terms of cylindrical co-ordinates?

5. Write down the polar expressions for $x^2 + y^2 = r^2$.

6. Give an example of a non-abelian group.

P.T.O.

7. Give an example of a ring which is not a field.

8. What is the dimension of C over R?

9. Give an example of periodic function with period 2π.

10. Give an example of a function which is neither odd nor even.

(10 × 1 = 10 Marks)

SECTION – B

Answer **any eight** questions from among the questions 11 to 22 Each question carries 2 marks.

11. Calculate $\vec{u}\times\vec{v}$, where $\vec{u}=\hat{i}+2\hat{j}-\hat{k}$ and $v=2\vec{i}-\vec{j}+\vec{k}$.

12. Find $\nabla f(1,0)$ where $f(x,y)=xe^{y}$.

13. Prove that $Curl(grad\, f)=0$, where f is a continuously differentiable scalar function.

14. State Kepler's first law.

15. Evaluate $\int_0^1\int_0^2\int_0^3 (x^2+y^2+z^2)\,dx\,dy\,dz$.

16 Find the polar co-ordinates of the point p whose rectangular Co-ordinaes are $\left(-2,-2\sqrt{3}\right)$.

17. Let G be a group and let $a\in G$. Then prove that $H=\{a^n / n\in z\}$ is a subgroup of G.

18. Prove that nZ is an additive group, where n is an integer.

19. Write down the standard basis for R^n.

20. Prove that $(1,1,0)$, $(1,0,1)$ and $(0,1,1)$ are linearly independent in R^3.

21. Prove that product of two even functions is even.

22. Write down the formula for half-range cosine series.

(8 × 2 = 16 Marks)

SECTION – C

Answer **any six** questions from the questions 23 to 31. Each question carries 4 marks.

23. Let $f(x,y)=xy$. Find $D_{\vec{u}}f(1,2)$ where $\vec{u}=\frac{\sqrt{3}}{2}\hat{i}+\frac{1}{2}\hat{j}$.

24. Prove that $\vec{u}.(\vec{v}\times\vec{w})=(\vec{u}\times\vec{v}).\vec{w}$.

25. Find $Curl(grand\ \phi)$, where $Q=xy+yz+zx$.

26. Find the graph of the parametric equations $x=\cos t,\ y=\sin t,\ 0\le t\le 2\pi$.

27. Find the rectnagular co-ordinates of the point P whose polar co-ordinates are $(r,\theta)=\left(6,2\frac{\pi}{3}\right)$.

28. Define * on Q^+ by $a*b=\frac{ab}{2}$. Prove that Q^+ is a group with respect to $*$.

29. Let V be a vector space over a field F, and let $\alpha\in V$. If α is a linear combination of vectors $r_j, j=1,2,....m$ and each $r_j, j=1,...m$ is a linear combination of $\beta_i, i=2..n$, then α is a linear combination of β_i.

30. Find the Fourier series of the function $f(x)=K,\ 0\le x\le 2\pi,\ f(x+2\pi)=f(x)$.

31. Find the half range sine series for $f(x)=x,\ 0<x<\pi$.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any two** questions from the questions 32 to 35. Each question carries 15 marks.

32. Show that the divergence of the inverse square field, $\vec{F}(x, y, z)=\frac{c}{\left(x^2+y^2+z^2\right)^{3/2}}\left(x\hat{i}+y\hat{j}+z\hat{k}\right)$ is zero.

33. Use a triple integral to find the volume of the solid within the cylinder $x^2+y^2=9$ and between the planes $z=1$ and $x+z=5$.

34. Let $S=\{\alpha_1, \alpha_2, \cdots \alpha_r\}$ be a finite set of linearly independent vectors of a finite dimensional vector space V over a field F. Then prove that S can be enlarged to a basis for V over F. Further more, if $B=\{\beta_1, \cdots \beta_n\}$ is any basis for V over F, then $r \leq n$.

35. Find the Fourier series of $f(x)=x^2$, $-\pi \leq x \leq \pi$, $f(x+2\pi)=f(x)$.

(2 × 15 = 30 Marks)

(Pages : 4) **H – 1741**

Reg. No. : .....

Name : .....

Third Semester B.Sc./B.C.A Degree Examination, October 2019

Career Related FDP Under CBCSS

Group 2 (b) - COMPUTER SCIENCE/COMPUTER APPLICATIONS

Group 2 (a) – PHYSICS AND COMPUTER APPLICATIONS

Core Course/Vocational Course

CS 1343/CP 1342/PC 1371 OPERATING SYSTEMS

(2014 to 2017 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A

(One word to maximum of **one** sentence. Answer **all** questions)

1. What is cache- coherency?.
2. What are the differences between a trap and interrupt?
3. How can we solve the problem of locating an offset within a file?
4. Differentiate UMA and NUMA.
5. Describe dynamic storage allocation problem.
6. What is internal fragmentation?
7. SCAN algorithm is sometimes called elevator algorithm. Why?

P.T.O.

8. What is the purpose of page replacement?

9. Differentiate single threaded and multithreaded process?

10. Which of the following scheduling algorithm could result in starvation?

    (a) first-come, first served

    (b) shortest job first

    (c) round robin

    (d) priority. **(10 × 1 = 10)**

SECTION – B [Short Answer]

Not to exceed **one** paragraph. Answer any **eight** questions. Each questions carries **2** marks

11. What are interprocess communication models?

12. Including the initial parent process, how many processes are created by the program shown below?

```
#include <stdio.h>

#include <unistd.h>

int main()
{
/*fork a child process*/

fork();
/*fork another child process*/
fork();
/*fork another*/
fork();
return 0;
}
```

13. Give a solution to the problem of indefinite blockage of low priority processes.

14. Differentiate:

    (a) text file and source file.

    (b) object file and executable file.

15. Explain the schemes for counting based page replacement.

16. How can we condense the length of the access control list?

17. What are the strategies to select a free hole from the set of available holes in?

18. Explain the requirements for the solution to the critical section problem.

19. Describe short-term, medium-term and long-term scheduling.

20. Why is it important for the scheduler to distinguish i/o bound programs from CPU- bound programs?

21. What you mean by logic bomb?

22. What is the purpose of address binding? **(8 × 2 = 16)**

SECTION – C [Short Essay]

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

23. Describe the general methods for passing parameters to the OS.

24. What are the characteristics of deadlock?

25. With neat diagram explain swapping.

26. Describe the actions taken by a kernel to context switch between processes.

27. Explain multithreading models.

28. What is the monitor type ADT?

29. Discuss the tradeoffs involved in directory implementation?

30. What do you mean by thrashing? How to overcome its effects?

31. Show the multithreaded server architecture. What are its benefits of multithreaded programming? **(6 × 4 = 24)**

SECTION – D [Long Essay]

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

32. What is the use of interprocess communication? Explain the fundamental models with necessary diagrams.

33. Explain contiguous memory allocation.

34. How to reduce the number of page faults? Explain with necessary diagrams.

35. Explain the concept of file. Including file operations and access methods? **(2 × 15 = 30)**

(Pages : 3) **F – 4248**

Reg. No. : .....

Name : .....

Third Semester B.Sc./B.C.A. Degree Examination, January 2019
Career Related FDP under CBCSS
Group 2(b) – Computer Science/Computer Applications &
Group 2(a) Physics & Computer Applications
Core Course/Vocational
CP 1342/CS 1343/PC 1371
OPERATING SYSTEMS
(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Very Short Answer Type)

One word to maximum of **one** sentences, answer **all** questions. **(10×1=10 Marks)**

1. How are operating systems designed in general ?
2. What does a time-sharing operating system require ?
3. How is a job different from a process ?
4. Why is the short-term scheduler called as CPU scheduler ?
5. Mention the three requirements to be fulfilled to solve the problem of critical section.
6. When is a set of processes is said to be in a deadlocked state ?
7. Give the use of base and limit registers.
8. Give the difference between physical and logical address space.
9. What is thrashing ?
10. What does boot-control block contain ?

SECTION – B
(Short Answer Type)

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

11. Distinguish between real-time operating system and parallel operating system.

12. Define the term : degree of multi-programming.

13. Define CPU burst and I/O burst.

14. Define inter-process communication.

15. Explain mutual exclusion.

16. How do you detect deadlock when there is single instance of each-resource type ?

17. What are the two factors to depend when we invoke deadlock detection algorithm ?

18. Explain roll-out, roll-in swapping policy. What does it require ?

19. Distinguish between global and local page replacement algorithms.

20. List the attributes of a file.

21. How is indexed allocation advantageous than linked allocation ?

22. Give the RAID structure and mention its uses.

SECTION – C
(Short Essay Type)

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

23. Briefly explain the basic functions of operating systems.

24. Give the importance and contents of process control block.

25. Distinguish between preemptive and non-preemptive scheduling schemes.

26. Describe the Peterson's solution to the problem of critical section.

27. Discuss the importance of Resource Allocation Graph.

28. Explain FIFO page replacement.

29. Explain the direct access method of a file.

30. Explain the problem of external fragmentation in continuous allocation. How is it solved ?

31. List various RAID levels. How do you select a RAID level ?

SECTION – D
(Long Essay Type)

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

32. Explain Round-Robin (RR) CPU scheduling algorithm in detail. How is it different from FCFS algorithm ?

33. Explain Banker's algorithm to avoid deadlocks.

34. Explain Paging memory management scheme in detail using diagrams.

35. Describe the common schemes of defining logical structure of a directory.

(Pages : 4) **H – 1344**

Reg. No. : .....

Name : .....

Third Semester B.A./B.Sc. Degree Examination, October 2019

First Degree Programme under CBCSS

English – (Language Course)

EN 1311.1/EN 1311.3 : WRITING AND PRESENTATION SKILLS

(Common for B.A./B.Sc. (Language Course VI) and Career related 2 (a) (Language Course V))

(2015 Admission onwards)

Time : 3 Hours Max. Marks : 80

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

A. Rewrite the following sentences, correcting the errors, if any.

1. Everybody in the class know the answer.
2. Ten miles are a long distance to walk.
3. 1 prefer coffee than tea.
4. I congratulated him for his success.
5. One of the teachers are absent today.

B. Write **one** synonym each for the following words :

6. strange
7. train
8. pause
9. observe
10. negotiate.

(10 × 1 = 10 Marks)

P.T.O.

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

11. Write a note on the importance of writing.

12. What is blogging?

13. What does the term 'conventions of language' refer to?

14. What is a memorandum?

15. Define collocation.

16. What is syntax?

17. Why is 'clubbing or clustering' important?

18. What is a report?

19. What is the difference between a précis and a summary?

20. What are morphemes?

21. What is a topic sentence? Explain its importance.

22. Explain the difference between writing and speaking.

(8 × 2 = 16 Marks)

III. Answer any **six** as directed :

23. Prepare an email to the HR manager of a company that is recruiting fresh graduates as trainee executives. Attach your resume.

24. Write a précis of the following passage reducing it to one third of its length

Malayalam is the mother-tongue of 35 million Malayalis, eighty percent of whom live in Kerala. The remainder are scattered over different parts of India and the world, including Malaysia, Singapore, the countries surrounding the Persian Gulf, Africa, Europe and North America.

Malayalis are well-known for their ability to adjust easily to their surroundings. Wherever a Malayali goes, from New Delhi to New York, he becomes a part of the local scene, though Kerala is always present in his heart.

Like its speakers, the Malayalam language also has been open to foreign influences. Malayalam literature reflects this spirit of accommodation and has, over the centuries, developed a tradition which, although deeply rooted in the native soil of Kerala, is truly universal in spirit. It is remarkably free from the prejudices that have marred the literature of certain other parts of our country. To its basic Dravidian stock have been added elements borrowed or adopted from non-Dravidian languages such as Sanskrit, Arabic, French, Portuguese and English. The earliest of these associations was with Tamil, which according to many linguists is the root language from which Malayalam was born. Sanskrit, however, accounts for the largest of the 'foreign' influences, followed closely in recent times by English. This broad-based cosmopolitanism has indeed become a distinctive feature of Malayalam language and literature.

25. Imagine that you are the secretary of the arts club in your college. Prepare a report on the various activities conducted by the arts club.

26. Write a letter to the principal of your college, making an enquiry about the courses offered there.

27. Prepare a questionnaire to evaluate the quality of the waste disposal system in your locality.

28. What is the difference between formal and informal letters?

29. Distinguish between academic and creative writing.

30. Imagine that you are the General Manager of a company. Prepare a memo to remind an employee to attend a quarterly sales meeting.

31. Create content for 8 to 12 slides on "The Festival of Onam".

(6 × 4 = 24 Marks)

IV. Answer any **two** as directed.

32. Write an essay on, "The impact of cinema on youth" in about 300 words.

33. Discuss the various stages of writing that enable a writer to create an ideal piece of writing.

34. What is an essay? What are the guidelines for writing a good essay?

35. Request the manager of a bank, in writing, for a replacement of the debit card you have lost.

(2 × 15 = 30 Marks)

(Pages : 3) **H – 1896**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, October 2019

Career Related FDP Under CBCSS

Group 2(a) – PHYSICS AND COMPUTER APPLICATIONS

Vocational Course

PC 1371

MICROPROCESSORS AND PROGRAMMING

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION – A (Very Short Answer Type)

[One word to maximum of one sentence. Answer **all** questions]

1. What is the purpose of AX register?
2. What is BIU?
3. What is the importance of Pin 19 in 8086?
4. What is BHE?
5. What is ALE?
6. What is DEN?
7. What is the use of JMP instruction?

P.T.O.

8. What is the capacity of data bus in 80186?

9. Give an example for direct addressing mode.

10. Give the name of an advanced Pentium processor.

(10 × 1 = 10 Marks)

SECTION – B (Short Answer)

[Not to exceed one paragraph, answer any **eight** questions. Each question carries **2** marks]

11. Name the various conditional flags used in 8086.

12. What is the significance of the pins AD0-AD15?

13. What is RESET?

14. What happens when LOCK in 8086 is active?

15. What is DT/R?

16. Name the logical operation instructions of 8086.

17. What is the purpose of the instruction JE/JZ?

18. Name the test registers in 80486 that allow the cache memory to be tested.

19. What is the main difference between Pentium processor and earlier microprocessors?

20. What is immediate addressing mode? Give an example.

21. Name any four assembly directives.

22. What is the use of Pin 32 in 8086?

(8 × 2 = 16 Marks)

SECTION – C (Short Essay)

[Not to exceed **120** words, answer any **six** questions. Each question carries **4** marks]

23. Explain various control flags used in 8086.

24. Differentiate INTR and INTA.

25. What is HOLD and HLDA?

26. Explain the importance of the pins M/IO and WR in 8086.

27. Explain the following instructions. A) ADD B) ADC C) SUB D) SBB

28. Explain the instructions for string manipulation in 8086.

29. Draw the timing diagram for write cycle in minimum mode.

30. Differentiate minimum mode and maximum mode 8086 system.

31. Explain hardware interrupts in 8086.

(6 × 4 = 24 Marks)

SECTION – D (Long Essay)

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

32. Explain the functional units of a microprocessor.

33. Explain data transfer instructions of 8086.

34. Explain the features of 80286 and 80386 processors.

35. Write an 8086 assembly language program to sort N numbers in ascending order.

(2 × 15 = 30 Marks)

(Pages : 4) **H – 1796**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, October 2019

First Degree Programme under CBCSS

Complementary Course for Statistics

PY 1331.3 – OPTICS, MAGNETISM AND ELECTRICITY

(2018 Admission)

Time : 3 Hours Max. Marks : 80

SECTION A

(Answer **all** questions in **one** or **two** sentences; each question carries **1** mark)

1. What is fringe width?
2. Why two independent sources are not coherent?
3. Explain Fraunhofer diffraction.
4. Define resolving power of a grating.
5. What is the importance of metastable state in the production of laser light?
6. What is the basic principle of fiber optic communication?
7. What are hard and soft magnetic materials?
8. What is Larmor frequency?
9. Why the core of a transformer made of laminated sheets?
10. What are the advantages of ac over dc?

(10 × 1 = 10 marks)

P.T.O.

SECTION B

(Answer **any eight** questions, not exceeding **a** paragraph; each question carries **2** mark)

11. What is interference of light?

12. Why a thickness film cannot produce interference when illuminated with white light?

13. Why a soap bubble in bright sunlight is beautifully colored?

14. Explain diffraction of light.

15. What is a grating? Explain grating element?

16. What is population inversion?

17. What is Laser? What are the applications of laser?

18. What is a graded index fiber? What is its advantage over step index fiber?

19. What is meant by hysteresis in magnetic materials?

20. Discuss curie Weiss law.

21. Distinguish between reactance and impedance.

22. What is a choke coil?

(8 x 2 = 16 marks)

SECTION C

(Answer **any six**, each question carries **4** marks)

23. Two waves having intensities in the ratio 1:9. Find the ratio of the intensity minimum to the maximum?

24. Two plane glass surface in contact along one edge are separated at the opposite edge by a thin wire. If 20 fringes are observed between these edges in sodium light ($\lambda = 5890A$) of normal incidence. What is the thickness of wire?

25. A monochromatic light of wavelength 5000A from a distant source falls on a slit 0.5mm wide. What is the distance between the two dark bands on each side of the central band of the diffraction pattern observed on a screen placed 2m from the slit.

26. A diffraction grating which has 5000 lines/cm is used at normal incidence. Calculate the dispersive power of the grating in the second order spectrum in the wavelength region 6000A.

27. Find the numerical aperture, acceptance angle and the critical angle of the fibre if light enters from air. Given refractive index of the core = 1.52 and the refractive index of the cladding = 1.47

28. An LCR circuit with L=4.0H, C=100 μF, R=40 Ω, is connected to a variable frequency 220V source. Calculate (i) resonance frequency (ii) impedance at resonance and (iii) amplitude of current at resonance.

29. A solenoid of 500 turns/m is carrying a current of 3A. Its core is made of iron which has a relative permeability of 5000. Determine the magnitude of the magnetic intensity, magnetization and magnetic field inside the core?

30. In the LCR circuit, the instantaneous voltage and current are

    E = 70.7 sin(500t + 30°) volts and I = 2.83 sin (500t + 30°) amperes.

    Find R and C, given L = 0.05H

31. In Young's double slit experiment the separation of the slit is 1.9mm and the fringe spacing is 0.31mm at a distance of 1m from the slits. Calculate the wavelength of the light.

(6 × 4 = 24 marks)

SECTION D

(Answer **any two** questions; each question carries **15** marks)

32. Explain the formation for Newton's ring. How can these be used to determine the wavelength of monochromatic light?

33. Discuss the theory of Fraunhofer diffraction by a single slit.

34. Explain Classical theory of diamagnetism.

35. With circuit diagram, explain briefly AC voltage applied to an LCR circuit.Describe resonance condition also.

(2 × 15 = 30 marks)

(Pages : 3) **F – 4163**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, January 2019
Career Related FDP under CBCSS
Group 2(a) : Physics and Computer Applications
Vocational Course
PC 1372 : DATA STRUCTURES
(2014 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

(Very Short Answer Type)

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

1. Define a pointer to a structure.

2. Differentiate between linear and non-linear data structures.

3. Write the advantage of doubly linked list over single linked list.

4. How is circular linked list created from double linked list ?

5. Expand : LIFO and give an example of data structure.

6. Define Binary Search Tree.

7. What is reverse polish node ?

8. Why is leaf node called so ?

9. Define Hashing.

10. Why is binary searching technique important ?

P.T.O.

SECTION – B
(Short Answer Type)

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

11. How do you access structure members using its pointer ?
12. Give the advantage of circular linked list over single linked list.
13. Convert (a+b)/c into polish notation.
14. How can you convert an expression from infix notation to prefix notation ?
15. Differentiate between binary tree and binary search tree.
16. Give the difference between linear and linked representation of binary tree.
17. Give an example for evaluation of a postfix expression.
18. Give an example to show that linear search is less efficient than binary search.
19. Write down a hash function.
20. Define graph.
21. Compare the two ways of traversing a graph.
22. Define directed graph and draw an example.

SECTION – C
(Short Essay Type)

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

23. With examples, explain the two ways of how structures can be passed to functions.
24. How is static representation of linked list advantageous than its dynamic representation ?
25. How do you represent a stack using array ?

26. How will you insert an element into a queue ?

27. Explain two types of traversing a binary tree with examples.

28. Define expression tree and write down its use.

29. Why is hash table searching important ?

30. Write the algorithm: exchange sort.

31. Give an example for breadth-first search.

SECTION – D
(Long Essay Type)

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

32. Explain the deletion and traversal operations on single linked list.

33. Explain how an infix expression is converted into postfix expression using stack with an example.

34. Explain insertion, deletion and processing of a node in a tree data structure.

35. Explain depth-first traversal of graphs with an example.

(Pages : 3) **H – 1897**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, October 2019

Career Related FDP Under CBCSS

Group 2(a)– Physics and Computer Applications

Vocational Course

PC 1372: DATA STRUCTURE

(2018 Admission)

Time : 3 Hours Max. Marks: 80

SECTION – A (Very Short Answer Type)

(One word to maximum of one sentence. Answer ALL questions)

1. Name any two linear data structures.

2. Name the operations on stack.

3. What is an array?

4. What is a queue?

5. Give the syntax for declaring a two-dimensional array.

6. Name the different tree traversals.

7. What do you mean by a pointer?

P.T.O.

8. What is a circular singly linked list?

9. What is a tree?

10. Name a LIFO and FIFO data structure.

(10 × 1 = 10 Marks)

SECTION – B (Short Answer)

(Not to exceed one paragraph, answer any **eight** questions. Each questions carries **2** marks)

11. What do you mean by linear search?

12. What is a hash table?

13. What is depth first search?

14. What do you mean by prefix notation?

15. What is bubble sort?

16. What is a doubly linked list?

17. What is a binary search tree?

18. What are the operations that can be implemented in a linked list?

19. Write the steps for performing deletion at the beginning of a singly linked list.

20. What do you mean by traversing a linked list?

21. What is a graph?

22. What is an expression tree?

(8 × 2 = 16 Marks)

SECTION – C (Short Essay)

(Not to exceed 120 words, answer any **six** questions. Each questions carries **4** marks)

23. Explain selection sort with illustration.

24. Explain binary search algorithm.

25. Explain the components of a graph data structure.

26. Write an algorithm to insert an element in a circular queue.

27. What are the advantages of a linked list over an array?

28. Explain the linked list implementation of inserting an element into stack.

29. Differentiate directed and undirected graphs.

30. Compare static and dynamic data structures.

31. Write an algorithm to perform search operation in a doubly linked list.

(6 × 4 = 24 Marks)

SECTION – D (Long Essay)

(Answer any **two** questions. Each questions carries **15** marks)

32. Explain the insertion and deletion operation in queues.

33. Explain the different binary tree traversals.

34. Explain the insertion and deletion operations on stack.

35. Explain the concept of insertion and deletion in a singly linked list with diagrams.

(2 × 15 = 30 Marks)

(Pages : 4) **F – 4162**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, January 2019
Career Related First Degree Programme under CBCSS
PHYSICS AND COMPUTER APPLICATIONS
Core Course
PC 1341 – Electrodynamics
(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. What are the boundary conditions for magnetostatic field ?
2. Write down the differential form of Ampere's circuital law.
3. What is the expression for energy density of an electrostatic field ?
4. Write down Maxwell's equations in vacuum.
5. State Norton's theorem.
6. Give the relation between H, M and B.
7. Define electric displacement vector D.
8. Draw the graph showing the variation of electric field with distance for a conducting spherical shell.
9. Explain displacement current.
10. Write Bio – Savart's law in vector form. **(10×1=10 Marks)**

P.T.O.

SECTION – B

Answer **any 8** questions. **Each** carries **2** marks.

11. Explain Faraday's law of electromagnetic induction.

12. Discuss power in ac circuits.

13. Describe the properties of electric field lines.

14. How does a uniform electric field act on an electric dipole ?

15. Derive the equation of continuity.

16. Explain Thevenin's theorem.

17. What is meant by resonance in a series LCR circuit ?

18. State and explain Gauss' law.

19. What is Poynting vector ?

20. Write any four properties of electromagnetic waves.

21. Discuss the divergence and curl of the electrostatic field.

22. What are the properties of equipotential surfaces ? **(8×2=16 Marks)**

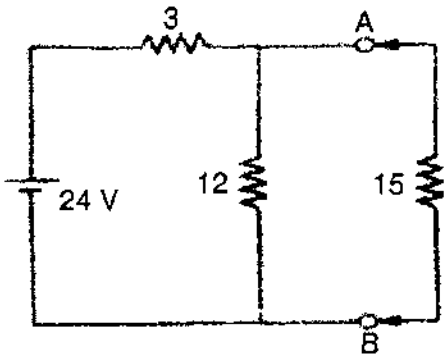
SECTION – C

Answer **any 6** questions. **Each** carries **4** marks.

23. Derive the relation between electric susceptibility and dielectric constant.

24. Consider a current carrying wire whose current varies in time. At a distance of 5.2 cm from the wire, the magnetic field changes at the rate of 0.13 T/s. Find the induced electric field at this point.

25. Find the Thevenin equivalent of the following circuit. The internal resistance of the cell is 1Ω.



26. An electric field is represented by the potential function V = 2x + 4y. Find the electrostatic energy density of the field.

27. An electric motor has a circular coil of 100 turns and radius 15 mm and is placed in a magnetic field of strength 23 $\times 10^{-3}$ T. If the current in the coil is 65 mA and the coil area vector makes an angle of 25° with the field at an instant, find the torque on the coil at this instant. Also find the maximum possible torque on the coil.

28. In an LCR circuit, the resistance is 25 Ω, inductance is 30 mH and capacitance is 12 μf. If an AC of rms value 90 V and frequency 500 Hz is supplied, find the net impedance and current in the circuit.

29. Find the work done to bring three electrons from infinity to the corners of an *equilateral triangle of side length* 1×10^{-10} *m.*

30. Find the electric field at the surface of a conductor having a surface charge density of 10 $\mu C/m^2$. *Compare this with the electric field at a distance of* 1×10^6 m from a proton.

31. An airplane travels at a speed of 1000 km/hr where the Earth's magnetic field is 5×10^{-5} T. The wings of the plane have tips that are 70 m apart. Find the potential difference induced between the tips. **(6×4=24 Marks)**

SECTION – D

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

32. Obtain Maxwell's equations in matter.

33. Using Gauss' law, obtain the expression for the electric field due to a uniformly charged sphere at points inside and outside the sphere. Plot the variation graphically.

34. Explain the concept of surface and volume bound charges. Obtain the relation between D, E and P.

35. State and explain Ampere's circuital law. Use it to derive an expression for the magnetic field due to a long solenoid. **(2×15=30 Marks)**

(Pages : 4) **H – 1648**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, October 2019

(Career Related First Degree Programme Under CBCSS)

Physics and Computer Applications

Core Course

PC 1341 : ELECTRODYNAMICS

(2014 Admission onwards)

Time : 3 Hours Max. Marks : 80

SECTION – A

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

1. State the principle of superposition in electrostatics.
2. Write down the Poisson's equation in electrostatics.
3. What do you mean by polar molecules?
4. Write down the Ampere's law in magnetostatics in integral form.
5. What do you mean by diamagnetic materials?
6. Give the expression for displacement current density J_d.
7. Write down the classical wave equation in one dimension.

P.T.O.

8. Define Poynting vector.

9. Define Q-factor of a series LCR circuit.

10. The internal resistance an ideal constant-current source is ——————

(10 × 1 = 10 Marks)

SECTION – B

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

11. Define intensity of electric field. Give an expression for the field due to a point charge q at a distance r from it.

12. Give the advantage of the potential formulation in electrostatics.

13. What is meant by atomic polarizability?

14. Prove that the perpendicular component of electric displacement always undergoes a discontinuity across a free surface charge density σ_f.

15. What is meant by bound charges? Why they are called so?

16. Derive the continuity equation.

17. Write down Faraday's law in differential form. Give its physical significance.

18. What is meant by monochromatic plane waves?

19. What is meant by polarization of electromagnetic waves?

20. Discuss the power factor of a coil having an inductance L and resistance R.

21. State Norton's theorem.

22. Why parallel LCR is called a rejecter circuit?

(8 × 2 = 16 Marks)

SECTION – C

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

23. The electric field in some region is found to be $E = kr^3 \hat{r}$, in spherical coordinates (k is some constant). Find the charge density ρ.

24. Find the expression for torque acting on an electric dipole when it is placed in a uniform electric field.

25. A long straight wire carries a uniform line charge density λ and is surrounded by rubber insulation out to a radius a. Find the electric displacement inside and outside the dielectric.

26. A particle of charge $3\mu C$, moving with a speed of 300 m/s perpendicular to a uniform magnetic field of magnitude 0.025 T traverses a circular path of radius 50 cm. Find the mass of the particle.

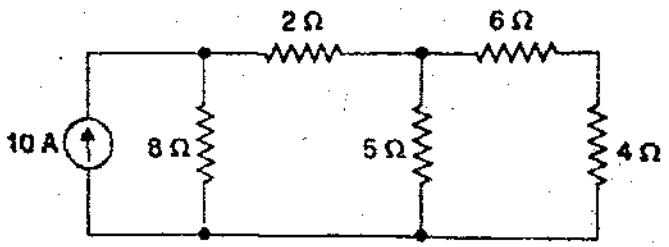
27. A resistor of uniform cross-sectional area 0.25 mm^2 and length 20 m is made from material with conductivity $6.7 \times 10^7 \, S/m$. If the potential difference between the ends is 2 V, what current flows?

28. A 100 W lamp radiates uniformly, calculate the amplitude of the electric field of the radiation at a distance of 2m from the lamp.($\epsilon_0 = 8.854 \times 10^{-12} \, F/m$, $c = 3 \times 10^8 \, m/s$).

29. The electric field of a plane electromagnetic wave is $E(z, t) = 100 \cos\left(10^7 \, \pi z - 3\pi \times 10^{15} \, t\right)\hat{x}$. Calculate the frequency and velocity of the wave.

30. A series LCR circuit has $L = 200 \, \mu H$, C = 0.0005 μF and $R = 10 \, \Omega$. Find resonant frequency and Q-factor of this circuit.

31. Calculate the current in 5Ω resistor by using the Norton's theorem.



(6 × 4 = 24 Marks)

SECTION – D

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

32. State and explain Gauss's law in electrostatics. Use Gauss's law to find the electric field inside a uniformly charged solid sphere (charge density ρ.)

33. Write a note on the Biot-Savart law in magnetostatics Write it for line, surface and volume currents. Starting from the Biot-Savart law for the general case of a volume current arrive at the Ampere's law $\nabla \times B = \mu_0 J(r)$.

34. How Maxwell fixed Ampere's law? Discuss the importance of Maxwell's correction. Write down Maxwell's equations. Discuss the possibility of magnetic charge based on the symmetry of Maxwell's equations.

35. State the Kirchhoff's laws applicable to AC circuits. Discuss the Maxwell's L/C bridge for determining the inductance of a coil.

(2 × 15 = 30 Marks)

(Pages : 3) **F – 4151**

Reg. No. : .....

Name : .....

Third Semester B.Sc. Degree Examination, January 2019
Career Related First Degree Programme Under CBCSS
Group 2 (a) : Complementary Course for Physics and Computer Applications
MM 1331.6 : MATHEMATICS – III – VECTOR DIFFERENTIATION, CO-ORDINATE SYSTEMS, ABSTRACT ALGEBRA AND FOURIER SERIES AND TRANSFORMS
(2013 Admission Onwards)

Time : 3 Hours Max. Marks : 80

SECTION – I

All the first **10** questions are **compulsory**. **Each** question carries 1 mark. **(10×1=10 Marks)**

1. What is the unit tangent vector to $r(t) = t^2 i + t^3 j$ at the point when $t = 2$?
2. Find the directional derivative of $f(x, y, z) = 2x^2 + 3y^2 + z^2$ at P (2, 1, 3) in the direction of $a = [1, 0, -2]$.
3. Find div v, where $v = [3xz, 2xy, -yz^2]$.
4. What is the expression for Cartesian co-ordinates in terms of spherical co-ordinates ?
5. State Kepler's first law.
6. Give an example of an abelian group.
7. What are the generators of z_4 with respect to addition modulo 4 ?
8. Give an example of a ring without multiplicative identity.
9. What is the fundamental period of sinx ?
10. Give an example of an even function.

P.T.O.

SECTION – II

Answer **any 8** questions from among the questions **11** to **22**. **Each** question carries **2** marks. **(8×2=16 Marks)**

11. Calculate the scalar triple product $\vec{u} \cdot (\vec{v} \times \vec{w})$ of the vectors

$$\vec{u} = 3\hat{i} + 2\hat{j} - 5\hat{k}, \vec{v} = 2\hat{i} + 3\hat{j} - 4\hat{k}, \vec{w} = \hat{i} - \hat{j} + \hat{k}.$$

12. Find curl $\vec{v}$, where $\vec{v} = yz\hat{i} + 3zx\hat{j} + z\hat{k}$.

13. Prove that curl (grad f) = 0, where f a continuously differentiable scalar function.

14. Evaluate $\int_0^1 \int_0^x \int_0^{1-y} z\,dz\,dy\,dx$.

15. Find the rectangular co-ordinates of the point with spherical co-ordinates $(P, \theta, \phi) = \left(1, \frac{\pi}{4}, \frac{\pi}{6}\right)$.

16. Find the polar co-ordinates of the point P whose rectangular co-ordinates are $\left(-2, -2\sqrt{3}\right)$.

17. Prove that every cyclic group is abelian.

18. Prove that $(2\mathbb{Z}, \cdot +)$ is a subgroup of $\mathbb{Z}$.

19. Prove that (1, –1), (2, 1) and (–3, 2) are linearly dependent in R^2.

20. Prove that {1, i} is a basis for C.

21. Prove that product of two odd functions is even.

22. If f is a periodic function with period 2π, write down its Fourier Series.

SECTION – III

Answer **any six** questions from the questions **23** to **31**. **Each** question carries **4** marks. **(6×4=24 Marks)**

23. If $\vec{u}$ and $\vec{v}$ are any two vectors, then prove that $\vec{u} \times \vec{v} = -(\vec{v} \times \vec{u})$.

24. If $\vec{u}$, $\vec{v}$ and $\vec{w}$ are any three vectors, prove that $\vec{u} \cdot (\vec{v} \times \vec{w}) = (\vec{u} \times \vec{v} \cdot \vec{w})$.

25. Let $\varphi(x, y, z) = xy + yz + zx$, find div (grad φ) at $(x, y, z) = (0, 1, 1)$.

26. Sketch the graph of $r = \cos 2\theta$ in polar co-ordinates.

27. Derive the equation for the parabola with focus (p, o) and direction $x = -p$.

28. In a group G, prove that the identity and inverse elements are unique.

29. If V is a vector space over F, then prove that $0\,\alpha = 0$, $\alpha\,0 = 0$ and $(-a)\,\alpha = a\,(-\alpha) = -(a\alpha)$, for all $\alpha \in F$ and $a \in V$.

30. Find the Fourier series of the function $f(x) = \begin{cases} 0 & \text{if } -2 < x < -1 \\ K & \text{if } -1 < x < 1 \\ 0 & \text{if } 1 < x < 2 \end{cases}$ with period = 4.

31. Find the half range cosine series for $f(x) = x$, $0 < x < \pi$.

SECTION – IV

Answer **any 2** questions from the questions **32** to **35**. **Each** question carries **15** marks. **(2×15=30 Marks)**

32. a) If $\bar{v}$ is any twice differentiable vector function, prove that div (curl v) = 0. **4**

    b) If $\bar{u} = y\hat{i} + x\hat{j} + xk$ and $\bar{v} = yz\hat{i} + zx\hat{j} + xy\hat{k}$, find $\bar{v} \cdot \text{curl}\,\bar{u}$, $\bar{u} \cdot \text{curl}\,\bar{v}$ and $\bar{u} \cdot \text{curl}\,\bar{u}$. **11**

33. Use a triple integral, find the volume of the solid within the cylinder $x^2 + y^2 = 9$ and between the planes $z = 1$ and $x + z = 5$.

34. a) Prove that a subgroup of a cyclic group is cyclic. **5**

    b) In a finite dimensional vector space, prove that every finite set of vectors spanning the space contains a subset which is a basis. **10**

35. Find the Fourier series for the function $f(x) = \begin{cases} -K & \text{if } -\pi < x < 0 \\ K & \text{if } 0 < x < \pi \end{cases}$ and $f(x+2\pi) = f(x)$.