Roll No. ..... [Total No. of Pages : 04

BC–2876

B. C. A. (Fourth Semester)

EXAMINATION, 2019

COMPUTER GRAPHICS AND

MULTIMEDIA APP.

Time : Three Hours

Maximum Marks :75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *six* questions. Each question carries 5 marks. 6×5=30

1. Write a brief note on different display devices. Explain about CRT.
2. Explain the following terms :

   (a) What is frame buffer ?

(b) Aspect Ration

(c) Resolution

(d) Pixel

5. Explain Back Face Detection method.

6. What is the need of homogeneous co-ordinates ?

7. What is seed fill ?

8. Distinguish between window port and view port.

9. Explain spline representation.

10. Explain area subdivision and A-Buffer method.

Section —B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 15×3=45

1. (i) Name the techniques for producing color display with CRT.

(ii) Use Bresenham's line algorithm to rasterize the line with end points (4, 2) and (10, 5).

2. (i) What are the important properties of Bezier Curve ?

(ii) What is line clipping ? Explain Cohen-Sutherland line clipping algorithm with suitable example.

3. (i) What is 2D transformation ? Explain scaling rotation and translation with example.

(ii) Consider on object ABC with co-ordinates A (1, 1), B (10, 1), C (5, 5). Rotate the object by 90 Degree in counter clockwise direction and give co-ordinates of transformed object.

4. (i) Write a short note on compression and decompression techniques of multimedia file.

(ii) Explain Multimedia Data interface standards.

(iii) Explain in detail Applications of Multimedia.

5. Write short notes any *three* of the following

(i) Parallel and Perspective Projections.

(ii) Define computer graphics animation.

(iii) (a) What is Tweening ?

(b) What is Fractals ?

(iv) Explain in detail about the boundary representation of three-dimensional objects.

(v) Mid-Point Circle Drawing Algorithm.

BC-2877

BCA (Semester-IV) Exam.–2015

Operating System

Time : Three Hours
Maximum Marks : **75**

Note :- Attempt questions from all the sections.

SECTION - A

(Short Answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 3×10=30

1. Explain the main purpose of an operating system.

2. What is demand passing?

3. What is Kernal?

4. Describe Real Time System.

[P. T. O.

5. What is virtual memory?

6. What are advantages of Multiprocessor system?

7. Describe the objective of multi programming.

8. What are time sharing system?

9. What is process? Explain.

10. What are the necessary condition of deadlock?

11. What is context switching?

12. Describe the long term, median term and short term schedular.

13. What is P.C.B.? Explain.

14. Describe the batch processing system.

15. Defferentiate between multiprogramming and multiprocessing system.

SECTION - B

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15x3=45

1. What is an operating system? Describe the types of Operating System.

2. Explain Banker's Algorithm in detail with suitable example.

3. What do you understand by pre-emptive and non-preemptive CPU scheduling? Describe with examples and also describe its advantages and disadvantages.

4. Describe deadlock with suitable example.

5. In shortest process first (SPF) consider there

are 4 ready process with their next CPU burst time as follows :

Process	Next CPU Burst Time
P1	6
P2	8
P3	7
P4	3

(a) draw gantt chart

(b) find waiting time of each process

(c) find average waiting time

6. Write short note on any three :

(a) Single user - Single process system

(b) Resource allocation graph

(c) Super Computer

(d) Distributed system

BC-2877

BCA (Semester-IV) Exam.–2016

Operating System

Time : Three Hours
Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 3×10=30

1. What is turnaround time?
2. What is Operating System?
3. What is Time Sharing System?
4. What is segmentation?
5. What is Dispatcher?
6. Write down any four system threats.
7. Differentiate between a trap and an interrupt.

[P. T. O.

8. What is paging and swapping?

9. What is File mounting?

10. What is kernal?

11. Differentiate between multiprogramming and multiprocessing system?

12. When do page fault occur?

13. Differentiate between internal and external fragmentations?

14. What is dead lock?

15. What in Virtual memory?

SECTION - B

(Long Answer type questions)

Note : Attempt **any 3** questions. Each question carries 15 marks. (15x3=45)

1. Compare a preemptive and non-preemptive scheduling algorithms with example.

2. Consider the following page reference string:
2,3,4,5,3,2,6,7,3,2,3,4,1,2,1,4,3,2,3,4,7

Calculate following page replacement algorithm with frame sizes of 3 and 5,
(i) LRU (ii) FIFO (iii) Optimal

3. How can deadlock be detected and recovered? Explain.

4. Following information is given about processes. What is the average waiting time & average turnaround time for FCFS, SJF(preemptive) & SJF (non preemptive)

Process	Arrival time	Burst time
P1	0.0	8
P2	0.4	4
P3	1.0	1

5. Describe different schemes for defining the logical structure of a directory.

6. Write short notes on any three :
   (i) Symbolic File System
   (ii) Swap space management
   (iii) Demand paging
   (iv) Disk Management system.

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BCA (Semester-IV) Exam. –2017

Operating System

Time : Three Hours. *Maximum Marks :* **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10x3=30

1. What are the activities of the operating system in connection with file management?

2. Give two reasons why caches are useful? What problems do they solve?

3. How is to be performed free space management in any disk management?

4. What is the role of process control block?

5. What is process scheduler?

[P. T. O.

6. What is the naming convention under direct communication of processes?

7. Why we use buffering in OS?

8. Why synchronization is used during message passing?

9. What is starvation problem related to deadlock?

10. What is required to support dynamic memory allocation in the contiguous memory allocation?

11. What is the purpose of paging the page tables?

12. What is demand paging system?

13. What are dedicated devices?

14. What are different storage devices?

15. What is the general model of a file system?

SECTION - B

(Long Answer type questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15x3=45

1. Explain why implementing synchronization primitives by disabling interrupt is note appropriate in a single processor system if the synchronization primitives are to be used in user-level program.

2. Write short notes on the following :
   (a) Segmentation
   (b) Distributed system
   (c) Parallel systems
   (d) Real Time System.

3. Consider the following set of process with the length of the CPU burst given in milliseconds :

Process	Burst Time	Priority
P_1	10	3
P_2	1	1
P_3	2	3
P_4	1	4
P_5	5	2

The processes are assumed to have arrived in the order P_1, P_2, P_3, P_4, P_5 all at time 0.

(a) What is the turn around time of each process for each of the scheduling algorithm FCFS & SJF.

(b) What is the waiting time of each process for each of the scheduling algorithm FCFS & SJF.

(c) Which algorithms resluts in minimum average waiting time.

4. What is classical problem of synchronization? Explain bounded Buffer problem.

5. What are the necessary conditions of deadlock? What are the requirements of deadlock avoidance and deadlock prevention?

Roll No. ..... [Total No. of Pages : 4

BC–2877

B. C. A. (Fourth Semester)

EXAMINATION, 2019

OPERATING SYSTEM

Time : Three Hours

Maximum Marks : 75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *ten* questions. Each question carries 3 marks. 10×3=30

1. Explain the advantages of Linux operating system.
2. Define process synchronization.
3. What do you understand by demand paging ?
4. Write a difference between pre-emptive and non-preemptive scheduling.

5. Define wait for graph.
6. Explain ready queue and waiting queue.
7. What is process ? Explain process control block.
8. What do you understand by Partioning algorithm ?
9. Explain Buffering.
10. Define Index Sequential File Access method.
11. What is CPU schedular ? Contrast different types of schedular.
12. What is starvation ?
13. What are the benefits of co-operating process ?
14. Differentiate between scan and C scan disk scheduling algorithm.
15. Consider the following snapshot of a system :

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P_0	0	0	1	2	0	0	1	2	1	5	2	0
P_1	1	0	0	0	1	7	5	0				
P_2	1	3	5	4	2	3	5	6				
P_3	0	6	3	2	0	6	5	2				
P_4	0	0	1	4	0	6	5	6				

Find the need matrix.

Section—B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 3×15=45

1. Define page replacement algorithm : FIFO, LRU and Optimal. Find the number of page feult for the following string : 2, 1, 3, 2, 1, 3, 2, 1, 2, 3, 1, 2, 1, 1, 3 using FIFO, LRU and optimal for the frame size 3 and 5.
2. Define semaphores and critical section problem. Also explain consumer-production problem.
3. What is deadlock ? What is the necessary condition for deadlock ? Also explain the algorithm for deadlock detection and avoidance.
4. What is CPU scheduling ? Define different type of CPU scheduling. Calculate Avg turn

Around time and Avg waiting time for the following process :

Process	Arrival Time (MS)	Burst Time (MS)
P_1	2	5
P_2	1	4
P_3	1	2
P_4	3	6
P_5	2	4

Also show a Gantt chart using FIFO, SJF and pre-emptive SJF algorithm.

5. What is an operating system ? Define Batch systems, Parallel system and Distributed systems.

6. Define File and its attribute. Also explain file directories. Define different type of file directories.

BC-2878

BCA (Semester-IV) Exam.–2015

Software Engineering

Time : Three Hours
Maximum Marks : **75**

Note :- Attempt questions from all the sections.

SECTION - A

(Short Answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10×3=30

1. What are the responsibilities of project manager?

2. "Software can not be manufactured" justify it.

3. What are the characteristics of software?

4. Write the definition of software engineering according to IEEE standard.

5. Differentiate validation and verification.

[P. T. O.

6. Which process model is most suitable for redefined problem for the system? Explain it.

7. What is SRS? Define its characteristics.

8. What are the requirement felicitation techniques?

9. "In software development life cycle design phase comes before coding." Justify the statement.

10. Give the difference between function oriented and object oriented design.

11. Define association and aggregation.

12. Explain test plan document.

13. Describe software reengineering.

14. What do you understand by reliability of a software?

15. Describe Control Flow Graph with suitable example.

SECTION - B

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 3×15=45

1. What is Documentation? What is the need of documentation? Also explain the categories of software documentation.

2. Define Modularization. Explain coupling and its types with example.

3. Draw DFD upto first level for college management system. (Use appropriate notations)

4. What is Testing? Explain levels of Testing. Also write the rules for writing Test plan and test cases.

5. Explain the follwing terms :
   (a) DFD
   (b) Flow chart
   (c) Sequence Diagram
   (d) Activity Diagram
   (e) Class Diagram

6. (a) Consider a project with the following functional units :

Number of user inputs = 50

Number of user outputs = 40

Number of user enquiries = 35

Number of user files = 06

Numer of external interfaces = 04

Assume all complexity adjustment factors and weighting factors are average. Compute the function points for the project.

(b) A new project with estimated 400 KLOC embedded system has to be developed. Project manager has a choice of hiring from two pools of developers, very high capable with very little experience in the programming language being used or developers of low quality but a lot of experience with the programming language. What is the impact of hiring all developers from one or the other pool?

BC/BS/BT-2097/2120/2137

BCA/B.Sc.(CS)/B.Sc.(IT)
(SEMESTER-IV) EXAM.-2016

Software Engineering

Time : Three Hours
Maximum Marks : **70**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any 7** questions. Each question carries 4 marks. 4×7=28

1. Discuss SDLC in Brief ?

2. What are the Characteristics of SRS? Explain.

3. What do you mean by a DFD? Explain some of the symbols used to draw a DFD.

4. What do you understand by the term 'Software testing'? What are the objectives of testing?

[P. T. O.

5. What is the difference between verification and validation.?

6. Explain waterfall model in detail with the help of a diagram?

7. Differentiate between top-down and bottom-up designing techniques.

8. Define cohesion and coupling.

9. Write short note on 4GL's technique?

10. What do you mean by software crisis? Discuss the problems and causes for the software crisis.

SECTION - B

(Long Answer type questions)

Note : Attempt **any two** questions. Each question carries 21marks. (21x2=42)

1. What are different types of maintenance that a software product might need? Why is such maintenance required?

2. What do you understand by software configuration management? How can you manage software configuration.

3. What is meant by the term testing? Explain the different types of testing performed during software development.

4. Explain the following :
   (a) Components of Software
   (b) Software Quality assurance
   (c) Software Reliability
   (d) Components of SRS

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BC–2878

B. C. A. (Fourth Semester)

EXAMINATION, 2019

SOFTWARE ENGINEERING

Time : Three Hours

Maximum Marks : 75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *ten* questions. Each question carries 3 marks. 10×3=30

1. What is software ? List the aesthetic properties of the software.

2. How does DFD, State chart and Z tools help in writing good SRS ?

3. List the formulae to measure correctness and modularity of the software.
4. List the key process activities at primary design.
5. What is walk through ? How is it different from software debugging ?
6. What is software volume metrics ? List the usage of LOC and KDL.
7. Differentiate between platform independency and software compatibility.
8. What is prototype model ?
9. Differentiate between operational and technical feasibility.
10. What is code inspection ? How is it different from logical proofing ?
11. What is software reusability ?
12. Differentiate between unit testing and system testing.
13. What is the difference between edition and version of a software ?

14. What is paralled method of software implementation ?
15. What are the techniques of software maintenance ?

Section—B
(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 3×15=45

1. Represent the format of SRS script of a new software. Explain the usage of the following tools in developing good SRS :
   (a) Structured English
   (b) SADT chart
2. Explain the importance of feasibility analysis of a software. Describe the various types of feasibility study made for a new software.
3. Enumerate the procedure with example to perform COCOMO to evaluate cost, time, effort and man-power requirement to develop a new software.

4. What is glass box testing ? How is it different from black box testing ?

5. Write notes on any *three* of the following :

   (a) Software evaluation

   (b) Software crisis

   (c) Software training

   (d) Software Re-engineering

BC-2879

B.C.A.(Semester-IV) EXAM.-2016

Optimization Technique

Time : Three Hours
Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any 10** questions. Each question carries 3 marks. 10×3=30

1. Define Basic feasible solution and slack variable.

[P. T. O.

2. Solve the following IPP using the simplex method.

$Max\ z = -x_1 + 4x_2$
$Subject\ to\ x_1 - x_2 \leq 1$
$-2x_1 + x_2 \leq 2$
$and\ x_1, x_2 \geq 0$

3. What is replacement problem? Describe some important replacement situations.

4. Balance the following transportation problem:

	D_1	D_2	D_3	D_4	$q_1\downarrow$
S_1	10	0	20	11	10
S_2	12	7	94	20	8
S_3	0	14	15	18	7
$b_1\rightarrow$	5	15	10	15	

5. Solve the following assignment problem :

Job

Person	J_1	J_2	J_3
P	20	15	18
Q	25	15	12
R	30	20	20

6. Find the economic lot size, the associated total cost, and the duration between two orders. It is given that the set-up cost is 100 Rs, the daily holding cost per unit of inventory is 5 paise, and daily demand is approximately 30 units.

7. Define the inventory costs.

8. Write Johnson's algorithm for processing n jobs two machines

9. We have five jods, each of which must go through two machines on arder AB, processing

times are given in the following table.

Job No.	1	2	3	4	5
Machine A	10	2	18	6	20
Machine B	4	12	14	16	8

Determine a sequence for the five jobs that will minimize the total elapsed time.

10. (i) Solve the following LPP using the graphical method

$$Max\ z = -x_1 + 2x_2$$
$$Subject\ to = -x_1 + x_2 \le 1$$
$$x_1 + x_2 \le 2$$
$$and\ x_1, x_2 \ge 0$$

11. State where model $\propto -$ model is called pure birth process in queueing theory

12. Define Queue and Service Mechanism.

13. Write the algorithm of simplex method.

14. Solve the following LPP using the graphical method:

$$MinZ = -5x_1 + 10x_2$$
$$Subject\ to = -x_1 + x_2 \le 1$$
$$x_1 + x_2 \le 2$$
$$and\ x_1, x_2 \le 0$$

15. What is the difference between transportation problem and assignment problem.

SECTION - B

(Long Answer type questions)

Note : Attempt **any 3** questions. Each question carries 15 marks. 15x3=45

1. Solve the following LPP using the Big-M-method

$$Max\ Z = -x_1 + x_2$$
$$Subject\ to\ x_1 + x_2 \le 1$$
$$2x_1 + 3x_2 \ge 6$$
$$and\ x_1 + x_2 \ge 0$$

2. Find the initial BFS of the following transportation problem suing VAM:

	D_1	D_2	D_3	Available
S_1	2	7	4	5
S_2	3	3	1	8
S_3	5	4	7	7
S_4	1	6	2	14
Req.	7	9	18	34

3. Solve the following assignment problem

		Job			
		J_1	J_2	J_3	J_4
Person	A	10	14	22	12
	B	16	10	18	12
	C	8	14	8	14
	D	20	8	16	6

4. Use dual simplex method to the following LPP

$Min\ Z = x_1 + x_2$

$Subject\ to = 2x_1 + x_2 \geq 2$

$-x_1 - x_2 \geq 1$

$x_1, x_2 \geq 0$

5. Explain (M/M/1) : $(\infty / FCFS)$ queueing model. Derive and solve the difference equations in steady state of the model.

6. Solve the following sequencing problem to minimize the total elapsed time

Job No.→	J1	J2	J3	J4	J5	J6
Machine M_1	3	12	18	9	15	6
Machine M_2	9	18	24	24	3	15

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BC - 2879

B.C.A. (Semester-IV) Exam.-2015

Optimization Technique

Time : Three Hours
Maximum Marks : **75**

Note :- Attempt questions from all the sections.

SECTION - A

(Short Answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10×3=30

1. Solve the following L.P.P. by graphical method

Maximize, $z = 6x_1 + 11x_2$

Subject to the constraints

$2x_1 + x_2 \leq 104$

$x_1 + 2x_2 \leq 76$ and $x_1, x_2 \geq 0$

2. A dietician decides a certain minimum intake of vitamins A, B, C for a family. The minimum

daily needs of vitamins A,B,C are 30,20,16 units respectively. For the supply of these, the dietician depends on two types of food X and Y. The first one give 7, 5, 2 units per gram of vitamins A, B, C respectively. The second one gives 2, 4, 8 units per gram of these vitamins respectively. The first food cost Rs. 2 per gram and the second Re. 1 per gram.

3. What is the difference between transportation problem and assignment problem.

4. Define term :
   (i) Mean service rate
   (ii) Steady state

5. Determine the initial basic feasible solution to the following trasportation problem using lowest cost entry method :

Each unit cost Rs. 30/Kg and the company. Personal estimate that it costs Rs. 130 to place an order and that the carrying cost of inventory is 10% per year. How frequently should order for revels be placed? Also determine the optimum size of each order.

13. Give the dual of the linear programming problem :

Min $z = 2x_1 + 3x_2 + 4x_3$

Subject to the constraints $2x_1 + 3x_2 + 5x_3 \geq 2$

$3x_1 + x_2 + 7x_3 = 3$

$x_1 + 4x_2 + 6x_3 \leq 5$, $x_1, x_2 \geq 0$

x_3 is unrestricted

14. What is unbalanced assignment problem and unbalanced transportation problem?

15. State when model α - model is called pure birth process in queueing theory.

SECTION - B

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15×3=45

1. Explain (M/M/1) : (∞/FCFS) queueing model. Derive and solve the difference equations in steady state of the model.

2. Solve the following L.P.P. by Big M-method

   Maximize $Z = x_1 + x_2 + 3x_3$

   S.T. $3x_1 + 2x_2 + x_3 \leq 3$

   $2x_1 + x_2 + 2x_3 \geq 3$ and $x_1, x_2, x_3 \geq 0$

3. Describe the problem of replacement of items whose maintenance costs increase with time. You may assume that the value of money remains constant. Hence establish the following rule for replacement. Do not replace if the next period cost is less than the weighted average of previous costs.

4. Find the optimum solution to the following transportation problem by using VAM method

for which the cost, origin, availabilities and destination requirements are given

		1	2	3	
					70
From	I	2	7	4	5
	II	3	3	7	8
	III	5	4	1	7
	IV	1	6	2	14
		7	9	18	

5. Solve the following assignment problem :

Company	Route A	B	C	D
1	4000	5000	-	-
2	-	4000	-	4000
3	3000	-	2000	-
4	-	-	4000	5000

6. Use dual simplex method to solve the following linear programming problem :

   Min $Z = x_1 + x_2$

   Subject to $2x_1 + x_2 \geq 2$

   $-x_1 - x_2 \geq 1$

   $x_1, x_2 \geq 0$

– 0 –

9. A firm is considering replacement of a machine whose cost price is Rs. 12,200; and the scrap value is Rs. 200. The maintenance costs are found from experience to be as follows :

Year	1	2	3	4	5	6	7	8
Maintenance Cost (Rs.)	200	500	800	1200	1800	2500	3200	4000

When should the machine be replaced.

10. We have five jobs, each of which must go through two machines on order AB, processing times are given in the following table :

Job No.	1	2	3	4	5
Machine A	10	2	18	6	20
Machine B	4	12	14	16	8

Determine a sequence for the five jobs that will minimize the total elapsed time.

11. What are different inventory costs associated with inventory control?

12. An aircraft company uses revels at an approximate customer rate of 2,500 kg/year.

		Destinations				
		A	B	C	D	Supply
Origin	1	1	5	3	3	34
	2	3	3	1	2	15
	3	0	2	2	3	12
	4	2	7	2	4	19
Demand		21	25	17	17	

6. What do you understand by a queue? Give some important application of queueing theory.

7. What is replacement problem? Describe some important replacement situations.

8. Customers arrive at a sales counter managed by a single person according to a poisson process with a mean rate of 20 per hour. The time required to serve a customer has an exponential distribution with a mean of 100 seconds. Find the average waiting time of a customer.

BC - 2879

B.C.A. (Semester-IV) Examination–2017

Optimization Technique

Time : Three Hours

Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10x3=30

1. Define individual and group replacement with suitable examples.

[P. T. O.

2. Solve the following LPP graphically

$Max\ z = 6x_1 + 9x_2$

Subject to constra int *s*

$2x_1 + 4x_2 \leq 3{,}000$

$3x_1 + x_2 \leq 3{,}000$

$2x_1 + 1.6x_2 \leq 3,000\ \&\ x_1, x_2 \geq 0$

3. Define the characteristics of queing system.

4. Discuss different types of costs involved in inventory.

5. Find the economic lot size, the associated total cost, and the duration between two orders. It is given that the setup cost is 100 Rs. The daily holding cost per unit of inventory is 5 paise and daily demand is approximately 30 units.

6. Define Johnson's algorithm for processing n jobs on two machines.

7. Define queue and service mechanism.

8. Define transportation problem with suitable example.

9. Define assignment problem with suitable example.

10. Determine the sequence for the five jobs that will minimize the elapsed time T, each job must go through 2 machines A and B. In order AB, processing time in hrs. are as follows :

Jobs	1	2	3	4	5
Time on Macine A (Ai)	5	1	9	3	10
Time on Macine B (Bi)	2	6	7	8	4

11. Define simplex method with suitable example.

12. Solve LPP by graphical method

$$\max \quad z = -x_1 + 2x_2$$
$$subject\ to = -x_1 + x_2 \leq 1$$
$$x_1 + x_2 \leq 2 \ and \ x_1, x_2 \geq 0$$

13. State where model ∞ - model is called pure birth process in queuing theory.

14. Discuss about best replacement age of machine.

15. Define Basic feasible solution with suitable example.

SECTION - B

(Long Answer type questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15x3=45

1. Describe Big - M method and solve the following LPP

$$Minimize\ z = 5x_1 + 3x_2$$
$$Subject\ to$$
$$2x_1 + 4x_2 \leq 12$$
$$2x_1 + 2x_2 = 10$$
$$5x_1 + 2x_2 \geq 10$$
$$and\ x_1, x_2 \geq 0$$

2. Solve the following transportation problem for its optimum solution also initial solution with NCOCR method.

	D_1	D_2	D_3	Supply
A	11	9	6	35
B	12	14	11	45
C	10	8	10	30
Supply	40	50	40	

3. Use dual simplex method to the following LPP

$$\min\ z = x_1 + x_2$$
$$\text{subject to } 2x_1 + x_2 \geq 2$$
$$-x_1 - x_2 \geq 1$$
$$\text{and } x_1, x_2 \geq 0$$

4. Solve the initial BFS of the following transportation problem using VAM

	D_1	D_2	D_3	Available
S_1	2	7	4	5
S_2	3	3	1	6
S_3	5	4	7	7
S_4	1	6	2	14
Req.	7	9	18	34

5. Describe two phase method of LPP with all steps and suitable example.

6. Describe Model I of queuing model i.e.

$$\{(M/M/U:(\infty/FCFS)\}$$

with all steps

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BC–2879

B. C. A. (Fourth Semester)

EXAMINATION, 2019

OPTIMIZATION TECHNIQUE

Time : Three Hours

Maximum Marks : 75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *ten* questions. Each question carries 3 marks. 10×3=30

1. Write the different techniques which we use in Operation Research.
2. State the management application of Operation Research.

3. Express the following LPP in standard form :

Minimum :

$$Z = 3x_1 + 4x_2 + 7x_3$$

Subject to :

$$2x_1 + 3x_2 - 2x_3 \leq 30$$
$$4x_1 - 2x_2 + x_3 \leq 22$$
$$x_1 - 5x_2 - 6x_3 \geq 4$$

$x_1 \geq 0$, x_2, x_3 are unrestricted.

4. Write algorithm of dual simplex method.
5. How do you categorise the queuing models in queuing theory ?
6. Solve the following LPP graphically :

Minimum :

$$Z = 5x + 7y$$

Subject to constraints :

$$x + 3y \geq 6$$
$$5x + 2y \geq 10$$
$$y \leq 4$$
$$x, y \geq 0$$

7. Explain the method of solving tic-tac problem.

8. Use simplex method to solve the following LPP :

Maximize :

$$Z = 20x_1 + 30x_2$$

Subject to :

$$3x_1 + 3x_2 \leq 36$$
$$5x_1 + 2x_2 \leq 50$$
$$2x_1 + 6x_2 \leq 60$$

and $x_1, x_2 \geq 0$.

9. Write formulae for the following statements :

(a) Probability of no. of customers in the system,

(b) Average (expected) queue length

(c) Probability [Queue size $\geq$ N]

10. Find the sequence that minimizes the total elapsed time required to complete the following jobs :

Job No.	Processing Time	
	A_i	B_i
1	2	6
2	5	8
3	4	1
4	3	2
5	2	3
6	1	5

11. Write algorithm for processing of n jobs through 2 machines.

12. The number of man-hours needed to complete a job for each job-man combination are given below :

		Jobs			
		A	B	C	D
Men	1	5	3	1	8
	2	7	9	2	6
	3	6	4	5	7
	4	5	7	7	6

Find the optimal assignment that will result in minimum man-hours needed.

13. Explain primal and dual form of linear programming problem.

14. Write the characteristics of queuing system.

15. Assuming that present value of one rupee to be spent in a year's time is ₹ 0.9 (v = 0.9) and A = ₹ 3,000 capital cost of equipment and the running cost are given in the table below. When should the machine be replaced ?

Year (n)	Running cost (₹)
1	500
2	600
3	800
4	1000
5	1300
6	1600
7	2000

Section—B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 3×15=45

1. Derive (M/M/1) : (∞/FCFS) queuing model upto the equation $P_n = \rho^n (1 - \rho)$ i.e. probability of *n*-customers in the system.

2. (a) What do you understand by Inventory Theory ? 5

   (b) A departmental store has a single cashier. During the rush hours, customers arrive at a rate of λ 20 customers per hour. The average number of customers that can be processed by the cashier is μ 24 hour. Assume that the conditions for use of the single channel queuing model apply : 10

   (i) What is probability that the cashier is idle ?

   (ii) What is the average number of customers in the queuing system ?

   (iii) What is the average time a customer spends in the system ?

   (iv) What is the average number of customers in the queue ?

   (v) What is the average time a customer spends in the queue waiting for service ?

3. (a) Derive economic lot size model with different rates of demand in different cycles.

   (b) A stockist has to supply 400 units of a product every Monday to his customers. He gets the produce at ₹ 50 per unit from the manufacture. The cost of ordering and transportation from the manufacturer is ₹ 75 per order. The cost of carrying

inventory is 7.5% per year of the cost of product. Find :

(i) The economic lot size

(ii) The total optimal cost (including capital cost)

4. Obtain an initial basic solution to the following transportation problem. Is this solution an optimal solution ? If not, obtain the optimal solution :

	W_1	W_2	W_3	W_4	a_i (Supply)
F_1	19	30	50	10	7
F_2	70	30	40	60	9
F_3	40	8	70	20	18
Requirement b_j	5	8	7	14	

5. Use two phase method to solve the following LPP :

Maximize :

$$Z = 5x_1 + 3x_2$$

Subject to :

$$2x_1 + x_2 \leq 1$$

$$x_1 + 4x_2 \geq 6$$

and $x_1, x_2 \geq 0$.

6. The following mortality rates have been observed for a certain type of light bulbs :

Week	Percent failing by end of week
1	10
2	25
3	50
4	80
5	100

There are 1000 bulbs in use and it costs ₹ 1.00 to replace an individual bulb which has burnt out. If all bulbs were replaced simultaneously it would cost 25 paise per bulb. It is proposed to replace all bulbs at fixed intervals, whether or not they have burnt out and to continue replacing burnt out 6 bulbs as they fail. What intervals should all the bulbs be replaced ?

BC-2880

BCA (Semester-IV) Examination–2015

Mathematics-III

Time : Three Hours

Maximum Marks : **75**

Note :- Attempt questions from all the sections.

SECTION – A

(Short Answer Type Questions)

Note : Attempt **any ten** questions. Each question carries three marks. 3×10=30

1. Express the following in a+ib form where a and b are real :

$$\frac{2-3i}{4-i}$$

2. Find modulus and principal arguments of :

$1-\cos\alpha + i\sin\alpha$

3. Discuss the convergence of the sequence {un}, where

$$un = \frac{n+1i}{n}$$

[P. T. O.

4. Discuss the nature of the series :

$$\frac{1}{1\cdot3}+\frac{1}{3\cdot5}+\frac{1}{5\cdot7}+\ldots\ldots\infty.$$

5. Prove that

$$\frac{d}{dt}\left(\bar{F}\times\bar{G}\right)=\bar{F}\times\frac{d\bar{G}}{dt}+\frac{d\bar{F}}{dt}\times\bar{G}$$

6. Calculate the directional deviative of the function ϕ (x, y, z) = xy^2+yz^3 at the point (1, –1, 1) in the direction of (3, 1, –1).

7. Find Fourier expression for

$$f(x) = \pi - x \quad \text{for} \quad 0 < x < 2\pi$$

8. Solve the differential equation

$$x^4\frac{dy}{dx}+x^3y=-\sec(xy)$$

9. Solve the equation

$$\frac{dy}{dx}=\frac{y}{x}+x\frac{\sin y}{x}$$

10. Solve the following

$$(D^2+4)\,y = 3x\sin x$$

11. Solve

$$x^2\frac{d^2y}{dx^2}-2x\frac{dy}{dx}-4y=x^4$$

12. Test the series for convergence :

$$\frac{2}{1^p}+\frac{3}{2^p}+\frac{4}{3^p}+\frac{5}{4^p}+\ldots.$$

13. Test the convergence of the series :

$$\frac{1}{2}x+x^2+\frac{9}{8}x^3+x^4+\frac{25}{32}x^4+\ldots\infty.$$

14. Find the normal vector of the curve at any point t :

$x = 3\cos t,\quad y = 3\sin t,\quad z = 4t.$

15. Prove that

$$\nabla\times(\bar{F}\times\bar{G})=\bar{F}(\Delta\cdot\bar{G})-\bar{G}(\nabla\cdot\bar{F})+(\bar{G}\cdot\Delta)\bar{F}-(F\cdot\Delta)\bar{G}$$

SECTION – B

(Long Answer Type Questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15×3=45

1. Write the definition of the following with examples :
   (a) Monotonic Sequences.
   (b) Convergent Series.
   (c) Function of a complex variable.

2. Suppose $\vec{U}$, $\vec{V}$ and f are continuously differentiable fields. Then div $(\vec{U} \times \vec{V}) = \vec{V} \cdot \text{curl}\, \vec{U} - \vec{U} \cdot \text{curl}\, \vec{V}$.

3. Find the Fourier series for

$$f(x) = \begin{cases} -\pi & , -\pi < x < 0 \\ x & , \quad 0 < x < \pi \end{cases}.$$

Deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots = \frac{\pi^2}{8}$$

4. Find the Fourier half-range cosine series function :

$f(t) = 2t, \; 0 < t < 1$

$= 2(2-t), \; 1 < t < 2.$

5. Solve : $\dfrac{dy}{dx} = \dfrac{x+2y-3}{2x+y-3}$.

6. Test the convergence of the series :

$$x + \frac{2^2 x^2}{L^2} + \frac{3^3 x^3}{L^3} + \frac{4^4 x^4}{L^4} + \ldots\ldots \infty.$$

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BC-45/2880

BCA IVth Semester Exam.-2016

Mathematics III

Time : Three Hours
Maximum Marks : **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any 10** questions. Each question carries 3 marks. 3×10=30

1. Express $(2+3i)/(4+5i)$ in the form $x+iy$.

2. Prove $\lim_{n\to\infty}(1+2/n)^n = e^2$.

3. If $r=(\ell+1)i+(\ell^2+\ell+1)j+(\ell^3+\ell^2+\ell+1)k$

   Find $dr/d\ell$ and $d^2r/d\ell^2$.

4. Find the directional derivative of $f(x,y,z)=x^2yz+4xz^2$ at the point $(1,-2,-1)$ in the direction of the vector $2i-j-2k$.

[P. T. O.

5. If $V = e^{xyz}(i+j+k)$, find Curl V.

6. Prove it "Every convergent sequence of real numbers is a cauchy sequence."

7. Solve $y - x\frac{dy}{dx} = a\left(y^2 + \frac{dy}{dx}\right)$.

8. Test the covergence of the series $\sum\left(1+1/n\right)^{-n^2}$.

9. Define the Periodic function.

10. Test the convergene of the series

$$\left(\frac{2^2}{1^2}-\frac{2}{1}\right)^{-1}+\left(\frac{3^3}{2^3}-\frac{3}{2}\right)^{-2}+\left(\frac{4^4}{3^4}-\frac{4}{3}\right)^{-3}+\ldots\ldots\ldots$$

11. Solve $x\cos x(dy/dx)+y(x\sin x+\cos x)=1$.

12. Find the fourier series of the function $f(x)=x,\ -\Pi<x<\Pi$.

13. Solve $(x^2-ay)\,dx-(ax-y^2)\,dy=0$

14. If $f = f1i + f2j + f3K$ is differentiable vector point function, then

$$\text{Curl } f = \left(\frac{\partial f_3}{\partial y}-\frac{df_2}{\partial z}\right)i+\left(\frac{\partial f_1}{\partial z}-\frac{\partial f_3}{\partial x}\right)j+\left(\frac{\partial f_2}{\partial x}-\frac{\partial f_1}{\partial y}\right)K.$$

15. Solve $(D^4+K^4)y=0$

SECTION - B

(Long answer type questions)

Note : Attempt **any three** questions. Each question carries 15 marks. (15x3=45)

1. Find the Fourier half-range cosine series of the function :

$$f(x)=\begin{cases}2t, & 0<t<1\\ 2(2-t), & 1<t<2\end{cases}$$

2. Solve

$$(x+2)\frac{d^2y}{dx^2}-(2x+5)\frac{dy}{dx}+2y=(x+1)e^x.$$

3. Prove that

$$\nabla\times(\nabla\times A)=\nabla(\nabla.A)-\nabla^2A$$

4. If <Sn> is a sequence of positive terms then $\lim_{n\to\infty} Sn^{Vn} = \lim_{n\to\infty}\frac{Sn+1}{Sn}$.
Provided the limit on the right hand side exists, whether finite as infinite.

5. If $a=\sin\theta i+\cos\theta j+\theta k,\ b=\cos\theta i-\sin\theta j-3K$ and $C=2i+3j-3k$, find $\frac{d}{d\theta}[a\times(b\times c)]$ at $\theta=\Pi/2$ and $\frac{d}{d\theta}(b\times c)$.

6. Obtain the fourier series of $f(x)=x+x^2,\ -\Pi<x<\Pi$ and Prove that

$$\frac{\Pi^2}{6}=1+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\ldots\ldots$$

BC-45/2880

BCA (Semester-IV) Examination–2017

Mathematics III

Time : Three Hours *Maximum Marks :* **75**

Note : Attempt questions from all sections.

SECTION - A

(Short-answer Type Questions)

Note : Attempt **any ten** questions. Each question carries 3 marks. 10x3=30

1. Express z = (1 - i) in modular amplitude form.

2. If $\left|\frac{z-1}{z+1}\right| = 2$. Prove that the locus of z on the argond plane is a circle.

3. Solve $\tan^{-1}\frac{x-1}{x-2} + \tan^{-1}\frac{x+1}{x+2} = \frac{\pi}{4}$

4. (a) Find value of $\left|e^{i\theta}\right|$

   (b) Define least upper bound

   (c) Periodic function in short

[P. T. O.

5. Prove that a sequence can not converges to more than one limit i - e limit of a sequence is unique

6. Show that the sequence <Sn> difined by

$Sn = \sqrt{n+1} - \sqrt{n}$, *if* $n \in N$ is convergent.

7. Show that <Sn> converges to e, where Sn is

$$Sn = \left(1 + \frac{1}{n+1}\right)^n$$

8. Every bounded monotonically increasing sequence converges, prove it.

9. Form the differential equation from

$y = Ae^{2x} + Be^{x} + C$ where A, B, C are constants.

10. Solve $(x + y)(dx - dy) = dx + dy$.

11. Find the divergence and curl of the vector field.

$V(x, y, z) = x^2 y^2 \overset{A}{i} + 2xy \overset{A}{j} + (y2 - xy) \overset{A}{k}$

12. Test for the convergence of the series

$$\Sigma \frac{\sqrt{n}}{n^2 + 1}$$

13. Show that if r = asin wt + b.cos wt, where a, b, w are constant. Then $\frac{d^2r}{dt^2} = -\omega^2 r$ and

$r x \frac{dr}{dt} = -wa\ x\ b$

14. If $r = |r|$ where $r = x\hat{i} + y\hat{j} + 2\hat{k}$, then prove that

$\nabla \log |r| = \frac{r}{r^2}$.

15. Solve $(1-x^2)\frac{dy}{dx} + 2xy = x\sqrt{1-x^2}$

SECTION - B

(Long Answer type questions)

Note : Attempt **any three** questions. Each question carries 15 marks. 15x3=45

1. Find the fourier series expansion for f (x) if

$$f(x) \begin{cases} -\pi\ ; & -\pi < x < 0 \\ x\ ; & 0 < x < \pi \end{cases}$$

deduce that

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots . \frac{?^2}{8}$$

2. State and prove Cauchy's first and second theorem on limits.

3. Solve $(D^2 - 3D + 2)y = 6e^{2x} + Sin2x$.

4. (a) If <Sn> is a Cauchy's sequence, then <Sn> is bounded, prove it.

   (b) Apply Cauchy's root test for the converge of series.

$$\frac{1}{2} + \frac{2}{3}x + \left(\frac{3}{4}\right)^2 . x^2 + \left(\frac{4}{5}\right)^3 x^3 + \ldots\ldots\ldots$$

5. (a) Test the convergence of the series whose n^{th} term is $\frac{\sqrt{n+1} - \sqrt{n-1}}{n}$.

   (b) A particle moves along the curve $x = 2t^2$, $y = t^2$, $z = 3t-5$, where t is time. Find the components of its velocity of acceleration at the time t = 1 in the direction $\hat{i} - 3\hat{j} + 2\hat{k}$.

6. Find fourier series for f(x) in the internal $(-\lambda, \lambda)$, where

$$f(x) = \begin{cases} x + \lambda & ; 0 \le x \le \lambda \\ -x - \lambda & ; -\lambda \le x < 0 \end{cases}$$

and $f(x + 2\lambda) = f(x)$

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BC–2880

B. C. A. (Fourth Semester)

EXAMINATION, 2020

MATHEMATICS—III

Time : Three Hours

Maximum Marks : 75

Note : Attempt questions from both Sections as directed.

Section—A

(Short Answer Type Questions)

Note : Attempt any *ten* questions. Each question carries 3 marks. 10×3=30

1. If z_1, z_2 are any *two* complex numbers, then prove that :

$$|z_1 + z_2| \leq |z_1| + |z_2| .$$

P. T. O.

2. Show that :

$$\tanh 2x = \frac{2\tanh x}{1+\tan^2 hx}.$$

3. Find the value of :

$$\sin^{-1}\frac{4}{5}+\sin^{-1}\frac{5}{13}+\sin^{-1}\frac{16}{65}.$$

4. Define the following in short :

(a) Monotonic sequence

(b) Divergence sequence

(c) Alternating series

5. Difference between comparison test and Raabe's test.

6. Test for the convergence of series :

$$\Sigma\frac{\sqrt{n}}{n^2+1}.$$

7. A particle moves along the curve $x=2t^2$, $y=t^2-4t$, $z=3t-5$, where t is the time. Find the components of its velocity and acceleration at time $t=1$ in the direction $\hat{i}-3\hat{j}+2\hat{k}$.

8. (a) What is solenoidal vector ?

(b) What is divergence of a constant vector ?

(c) Show that the function $\phi(x, y, z)=x^2-y^2+4z$ is harmonic.

9. Find the Fourier series of the following function :

$$F(x)=x^3,\ -\pi<x<\pi.$$

10. Solve :

$$(e^y+1)\cos x\,dx+e^y.\sin x\,dy=0.$$

11. Solve :

$$(2x+y-3)\,dy=(x+2y-3)\,dx.$$

12. Solve :

$$(1+y^2)\,dx=(\tan^{-1}y-x)\,dy.$$

13. Test for convergence of series by Raabe's test :

$$\sum_{n=1}^{\infty}\frac{2.4.6.....2n}{1.3.5.....(2n+1)}.$$

14. Solve :

$$\frac{d^2y}{dx^2}+31\frac{dy}{dx}+240y=272\,e^{-x}.$$

15. Solve :

$$(D^3+3D^2+2D)y=x^2.$$

Section—B

(Long Answer Type Questions)

Note : Attempt any *three* questions. Each question carries 15 marks. 3×15=45

1. **(a) Solve :**

$$\frac{d^4y}{dx^4}+m^4y=0.$$

(b) Solve :

$$\frac{d^2y}{dx^2}-8\frac{dy}{dx}+9y=40\,.\sin 5x.$$

2. **Solve :**

$$(D^2-2D+1)y=x\sin x.$$

3. Find Fourier series of the periodic function $f(x)$, where :

$$f(x)=\begin{cases}-\pi\,; & -\pi<x<0\\ x\,; & 0<x<\pi\end{cases}$$

Hence, deduce that :

$$\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots$$

4. (a) A sequence cannot converges to more than one limit. Prove it.

(b) Prove that :

$$\lim_{n\to\infty}\left[\frac{(3n)!}{(n!)^3}\right]^{1/n}=27.$$

5. (a) Write Cauchy's root test.

(b) Test for convergence of series :

$$\frac{x}{1.3}+\frac{x^2}{2.4}+\frac{x^3}{3.5}+\frac{x^4}{4.6}+\ldots\ldots/x>0)$$

6. If a be constant vector and $r = x\hat{i} + y\hat{j} + z\hat{k}$, show that :

(i) $\text{div}\,(a \times r) = 0$

(ii) $\text{curl}\,(a \times r) = 2a$

(iii) $a \times (\nabla \times r) = \nabla(a.r) - (a.\nabla)_r$