Code No. 7072

FACULTY OF SCIENCE

B.Sc. (CBCS) III – Semester Examination, December 2017

Subject : COMPUTER SCIENCE

Paper – III (SEC-I)

B : Boolean Algebra

Time : 1 ½ hours | Max. Marks : 40

Answer all questions from Part-A and Part-B.

Part – A (2 X 5 = 10 Marks)

(Short Answer Type)

1 a) Convert the decimal numbers 231 and 763 to binary numbers.

OR

b) State and prove the DeMorgan's laws using truth tables.

2 a) Explain the Exclusive-OR and equivalence operations.

OR

b) Find the min-term expansion of $f(a,b,c,d) = a'(b'+d) + acd'$.

Part – B (2 X 15 = 30 Marks)

(Essay Answer Type)

3 a) i) Explain the addition of 2's complement binary numbers with example.

ii) Write the gray codes and Excess-3 codes for decimal digits 0 to 9.

OR

b) i) Explain the basic operations of Boolean algebra with truth table and symbols.

ii) Simplify the following expressions using basic Boolean identities :

$A'B'C + (A'B'C)'$ and $(A'B + CD')(A'B + CE)$.

4 a) Explain the algebraic simplification of switching expressions and prove the validity of an equation with suitable examples.

OR

b) Explain the design and implementation of full adder.

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STATISTICS
I YEAR I SEM

Code No. 10284

FACULTIES OF ARTS, COMMERCE, SCIENCE & SOCIAL SCIENCES

B.A./B.Com. /B. Sc./ BBA/ BSW I- Semester (CBCS) Examination, Dec. 2017

Subject: General English

Paper – I

Time: 3 Hours **Max Marks: 80**

Part A (5 x 4 = 20 marks)

Answer any 5 of the following.

1) **Answer as directed.**

a) Ever since industrialization, cities have become over populated. (Identify the common noun).
b) A ____________ of stars. (Fill in the blank with a collective noun).
c) Chronology. (Identify the root in the given word).
d) Momento. (Correct the spelling)

2) **Answer as directed.**

a) She prides ____________ on her wealth. (Fill in the blank with appropriate pronoun).
b) Pen is mightier to sword. (Correct the underlined word).
c) Our team won the hockey champion. (Add an appropriate suffix to the underlined word).
d) ____________ qualify. (Add an appropriate prefix to form the antonym of the given word).

3) **Answer as directed.**

a) My team ____________ yet lost a match. (Fill in the blank with the correct auxiliary verb).
b) I ____________ like driving, I prefer to go by cab. (Fill in the blank with the correct auxiliary verb).
c) She bought a ____________ of gloves. (Fill in the blank with the correct option between 'pare' and 'pair').
d) They were not happy with the ____________. (Fill in the blank by adding the correct suffix to 'accomodate').

4) **Answer as directed.**

a) Give the present and present participle forms of the verb 'felt'.
b) How have you been____________? (Fill in the blank with the correct form of 'do').
c) Hard work can bring a difference in one's life. (Correct the underlined collocation).
d) A number of students fail to submit their ____________ in time. (Fill in the blank with the correct form of 'assign').

5) **Answer as directed.**

a) Dance. (Write the phonetic transcription of the given word).
b) Gate. (Write the phonetic transcription of the given word).
c) Bound. (Write the phonemic symbol of the underlined diphthong).
d) Bring. (Transcribe the sound of 'ng' in the given word using IPA symbols).

6) **Expand the following topic sentence into a paragraph.**
Watching what one eats goes a long way in promoting one's health and wealth.

7) **Arrange the following sentences in a logical sequence.**

a) The way we sit, walk, stand, and talk actually conveys more than the words we use.

b) Non-verbal communication is communicating without speaking, through our body language or pictures etc.

c) Since non-verbal communication is more powerful than verbal, one should take care of one's body language.

d) Gestures, facial expressions, posture of our body, tone are all part of non-verbal communication.

8) **Complete the following conversation.**

A: Hi Rajesh! I was hoping to meet you today.

B: ____________________________.

A: You see, I have a problem.

B: ____________________________________.

A: I am in a terrible dilemma about my future course of study.

B: ____.

A: Do we really have a career guidance cell at our college?

Part B (5 x 12 = 60 Marks)

Answer the following questions in about 300 words each.

9) a) What were the idiosyncrasies of Dorothy and Charlie and how did it affect their marriage?

OR

b) What was the cause for Charlie's mental breakdown?

10) a) What, according to Inge, are the things that are supposed to make people happy?

OR

b) What are the three things that Inge would wish for and why?

11) a) Is "A Psalm of Life" a pessimistic or an optimistic poem? Justify your answer.

OR

b) Justify the title of the poem "A Psalm of Life".

12) a) How does the play "The Dear Departed" depict human beings?

OR

b) Between the two sisters Amelia and Elizabeth, who is more scheming and hypocritical? Justify your answer.

13) a) Explain the significance of 'Bathukamma' and 'The Million March' in the State of Telangana.

OR

b) Write about the importance of motivation and self-confidence.

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Code No. 7001/E

FACULTIES OF ARTS, SCIENCE, COMMERCE, SOCIAL SCIENCES & MANAGEMENT

B.A./B.Sc./B.Com./B.S.W./ B.B.A. (CBCS) I-Semester Examination, December 2017

Subject : Environmental Studies

Paper – I : AECC – I

Time : 1½ Hours **Max. Marks: 40**

Note: Answer all questions from Part – A and Part – B.

PART – A (2 x 5 = 10 Marks)
(Short Answer Type)
Note : Answer the following questions.

1 Hot spots
2 Global warming

PART – B (2 x 15 = 30 Marks)
(Essay Answer Type)

3 (a) Write in brief about watershed management.

OR

(b) Write an account on species and ecosystem diversity.

4 (a) Discuss the role of Information technology in environment and human health.

OR

(b) Describe briefly the causes, effects and control measures of Air pollution.

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Code No. 2090

FACULTY OF SOCIAL SCIENCE

B.A. / B.Sc. / B.Com./ B.S.W./ BBA II-Semester (CBCS) Examination,

May / June 2017

(Common for All Faculties)

Subject : Gender Sensitisation

AECC : Paper – II

Time : 1½ Hours **Max. Marks: 40**

Note: Answer all questions from Part – A and Part – B.

PART – A (2 x 5 = 10 Marks)
(Short Answer Type)
Note : Answer the following questions.

1 The concept of Gender.

2 Gender and Constitutional Safeguards.

PART – B (2 x 15 = 30 Marks)
(Essay Answer Type)

3 (a) Explain the various perspectives available to analyze the gender.

OR

(b) Examine the gender based division of labour with suitable examples.

4 (a) Explain the gender justice with reference to human rights.

OR

(b) 'Print and electronic media have been providing the considerable place to present the women issues' – comment.

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Code No. 7006 / E

FACULTY OF SCIENCE

B.Sc. I-Semester (CBCS) Examination, December 2017

Subject: Mathematics

Paper – I

Differential Calculus

Time: 3 Hours Max.Marks: 80

PART – A (5x4 = 20 Marks)
[Short Answer Type]

Note: Answer any <u>FIVE</u> of the following questions.

1 Find the n^{th} derivative of $f(x) = \dfrac{1}{6x^2 - 5x + 1}$.

2 Expand $f(x) = e^x$ in powers of $(x-2)$.

3 Evaluate $\lim\limits_{x \to 0} \dfrac{x \cos x - \log(1+x)}{x^2}$

4 Find the radius of curvature of the curve $x^4 + y^4 = 2$ at the point $P(1,1)$.

5 If $w = x^2 + y^2$, $x = r-s$ and $y = r+s$ then evaluate $\dfrac{\partial w}{\partial r}$ and $\dfrac{\partial w}{\partial s}$.

6 If $z = f(x+ay) + g(x-ay)$ then show that $\dfrac{\partial^2 z}{\partial y^2} = a^2 \dfrac{\partial^2 z}{\partial x^2}$.

7 Find the envelope of the family of circles $x^2+y^2 - 2ax\cos\alpha - 2ay\sin\alpha = c^2$ where α is the parameter.

8 Find the asymptotes of the curve $\gamma = \dfrac{a\theta}{\theta - 1}$.

PART – B (4x15 = 60 Marks)
[Essay Answer Type]

Note: Answer <u>ALL</u> the questions.

9 a) If $\cos^{-1}\left(\dfrac{y}{b}\right) = \log\left(\dfrac{x}{n}\right)^n$ then show that $x^2 y_{n+2} + (2n+1)\, x y_{n+1} + 2n^2 y_n = 0$.

OR

b) i) State and prove Rolle's mean value theorem.

ii) If Rolle's mean value theorem holds for the function $f(x) = x^3 + ax^2 + bx$, $1 \le x \le 2$ at the point $x = \dfrac{4}{3}$ then find the values of a and b.

10 a) Find the circle of curvature of the curve $x = a(\cos t + t \sin t)$, $y = a(\sin t - t \cos t)$ at $t = \frac{\pi}{4}$.

OR

b) i) Evaluate $\lim_{x \to 0}\left(\frac{1}{x^2} - \frac{1}{\sin^2 x}\right)$.

ii) Evaluate $\lim_{x \to \frac{\pi}{4}} (\tan x)^{\tan 2x}$.

11 a) i) If $u = \cos^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$, then show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + \frac{1}{2}\cot u = 0$.

ii) If $x^y + y^x = a^b$ then find $\left(\frac{dy}{dx}\right)$.

OR

b) Expand $f(x,y) = e^x \cos y$ in terms of $(x-1)$ and $\left(y - \frac{\pi}{4}\right)$ using Taylor's theorem.

12 a) Find the asymptotes of the curve $x^3 - 6x^2y + 11xy^2 - 6y^3 + x + y + 1 = 0$.

OR

b) Find the minimum value of $x + y + z$, subject to the condition $\frac{a}{x} + \frac{b}{y} + \frac{c}{z} = 1$.

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Code No. 266 /

FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May / June 2017

Subject : Mathematics

Paper – II : Differential Equations

Time : 3 Hours Max. Marks: 8

PART – A (5 x 4 = 20 Marks)

(Short Answer Type)

Note : Answer any FIVE of the following questions.

1 Show that the equation

$$xdx + ydy = \frac{a^2(xdy - ydx)}{x^2 + y^2}$$ is exact.

2 Solve $\frac{dx}{x(y^2 - z^2)} = \frac{dy}{y(z^2 - x^2)} = \frac{dz}{z(x^2 - y^2)}$

3 Solve $\frac{d^3y}{dx^3} + y = e^{-x} + 1$

4 Solve $(D^2 - 4)y = x^2$

5 Find the particular integral of $\frac{d^2y}{dx^2} + y = \sec x$ by method of variation of parameters.

6 Solve $x^2\frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$

7 Solve $pz - qz = (x + y)^2 + z^2$

8 Solve $\sqrt{p} + \sqrt{q} = 1$

PART – B (4 x 15 = 60 Marks)

(Essay Answer Type)

Note: Attempt ALL the questions.

9 (a) Solve $(xy^2 - x^2)dx + (3x^2y^2 + x^2y - 2x^3 + y^2)dy = 0$

OR

(b) Solve $y + px = x^4p^2, \left(p = \frac{dy}{dx}\right)$.

10 (a) Solve $(D^2 - 4D + 4)y = 8(x^2 + e^{2x} + \sin 2x)$.

OR

(b) Solve $(D^3+1)y = \cos 2x$.

11 (a) Solve $(D^2 + 4D + 4)y = 4x^2 + 6e^x$ by method of undertermined coefficients.

OR

(b) Solve $x^4\frac{d^3y}{dx^3} + 2x^3\frac{d^2y}{dx^2} - x^2\frac{dy}{dx} + xy = 1$

12 (a) Solve $(x^2 - yz)p + (y^2 - zx)q = z^2 - xy$.

OR

(b) Solve $\frac{\partial u}{\partial x} = 2\frac{\partial u}{\partial t} + u$ where $u(x,0) = 6e^{-3x}$ by the method of separation of variables.

Code No. 270

FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May / June 2017

Subject : Electronics

Paper – II : Electronic Devices

Time : 3 Hours **Max. Marks: 80**

PART – A (5 x 4 = 20 Marks)
(Short Answer Type)
Note : Answer any FIVE of the following questions.

1 Explain the effect of temperature on reverse saturation current.
2 What is Zener breakdown? How does it varies with doping concentration?
3 For a transistor circuit α=0.99, I_{CBO}=5μA and I_E=5mA. Calculate I_C, I_B and I_{CEO}.
4 Write a note on h-parameters.
5 State two differences between JFET and MOSFET.
6 Explain how FET acts as voltage variable resistor.
7 Draw two transistor representations of SCR. Mention two applications.
8 Write a note on LED.

PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)
Note: Attempt ALL the questions.

9 (a) How PN Junction diode is formed? Explain V-I characteristics with suitable circuit diagram. Mention its applications.

OR

(b) Explain the construction, characteristics and uses of varactor diode.

10 (a) Explain the output characteristics of BJT in CBC with a circuit diagram. Show the cutoff, active and saturation regions in it.

OR

(b) Explain the working of a transistor. Establish the relation

$$\beta = \frac{\alpha}{1-\alpha} \text{ and } \alpha = \frac{\beta}{1-\beta}\ .$$

11 (a) Sketch the cross section of a P-channel enhancement MOSFET. Draw its drain and transfer characteristics.

OR

(b) Explain the V-I characteristics of a Unijunction transistor. Explain the difference between BJT and UJT.

12 (a) Explain the construction and working of SCR.

OR

(b) Explain the construction, working and characteristics of LDR.

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Code No. 7076

FACULTY OF SCIENCE

B.Sc. (CBCS) III – Semester Examination, December 2017

Subject : ELECTRONICS

1059-16-474-088

Paper – III

Analog Circuits

Time : 3 hours

Max. Marks : 80

Part – A (5 X 4 = 20 Marks)

(Short Answer Type)

Answer any Five of the following questions.

1 Derive the expression for efficiency of a full wave rectifier.
2 Derive the expression for the ripple factor of L-section filter.
3 Explain the terms line regulation and load regulation.
4 Explain about 7805 and 7905 IC voltage regulators.
5 Discuss briefly the classification of amplifiers on the basis of operating conditions.
6 What is darlington pair? Give its merits and demerits.
7 What is an oscillator? Draw the circuit diagram of RC phase shift oscillator.
8 Draw the circuit diagram of an astable multivibrator.

Part – B (4 X 15 = 60 Marks)

(Essay Answer Type)

Answer ALL questions from the following :

9 a) Describe the operation of a half wave rectifier with the help of circuit diagram and relevant waveforms. Obtain the expression for i) rectifier efficiency ii) ripple factor iii) voltage regulation

OR

b) Explain how a series inductor filter gives a rectified output current. Derive the expression for voltage regulation and ripple factor when this filter is used.

10 a) Explain the working of series and shunt regulated power supply with neat circuit diagrams.

OR

b) Draw the circuit diagram of the switch mode power supply and explain its working.

11 a) Derive the expressions for current gain and input impedance of single stage common-emitter transistor amplifier using hybrid π model of transistor.

OR

b) Explain the principle of feedback. Discuss the effect of negative feedback on gain, input impedance and output impedance.

12 a) Explain the working of Colpitt's oscillator with the help of neat circuit diagram and derive the expression for its frequency of oscillation.

OR

b) What are the different types of multivibrators? With the help of circuit diagram explain the operation of a monostable multivibrator.

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Code No. 7070

FACULTY OF SCIENCE

B.Sc. (CBCS) III – Semester Examination, December 2017

Subject : STATISTICS

Paper – III

Statistical Methods

Time : 3 hours | Max. Marks : 80

Part – A (5 X 4 = 20 Marks)

(Short Answer Type)

Answer any Five of the following questions.

1 Explain the scattered diagram method for measuring the correlation.

2 Explain the concept of two lines of regression.

3 State the formula for the computation of a partial correlation coefficients for three variables.

4 Define i) order of a class ii) Ultimate classes

5 Define i) Population parameter and ii) Sample statistic with examples.

6 Define unbiasedness of an estimator with an example.

7 State the properties of Maximum likelihood estimator.

8 Define interval estimation.

Part – B (4 X 15 = 60 Marks)

(Essay Answer Type)

Answer ALL questions from the following :

9 a) i) Obtain the formula for spearman's rank correlation coefficient.

ii) Derive the normal equations for fitting of a curve of the type $y = ax^b$.

OR

b) i) Derive the Regression line of Y on X.

ii) State and prove the properties of regression coefficients.

10 a) i) Define multiple correlation with an example for three variables and state the formula for $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$.

ii) If $r_{12} = 0.77$, $r_{13} = 0.72$ and $r_{23} = 0.52$. Find the values of $R_{1.23}$, $R_{2.13}$ and $R_{3.12}$.

OR

b) i) Define positive association, negative association and independence of attributes.

ii) Derive the relationship between Yule's coefficient of association and coefficient of colligation.

11 a) i) Define sampling distribution of a statistic and standard error.

ii) Define χ^2 - distribution. State its properties and applications.

OR

b) i) Define consistency and sufficiency with examples.

ii) State and prove sufficient conditions for consistency.

12 a) i) State Neyman's Factorization theorem.

ii) Find the sufficient estimator for θ in case of exponential distribution.

OR

b) i) Explain the method of MLE.

ii) Find the MLE for the parameter λ of Poisson distribution on the basis of sample of size n. Also find its variance.

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55 19532 / 2.14 / 519746

Code No. 028

FACULTIES OF ARTS AND SCIENCE

B.A. / B.Sc. III – Year Examination, March / April 2017

Subject : STATISTICS (Theory)

Paper – IV

Quality Control, Reliability and Operations Research (Elective-I)

Time : 3 hours **Max. Marks : 100**

Note : Answer all questions. Answer questions I to IV by choosing any two from each and any three from question V. All questions carry equal marks. Scientific calculators are allowed.

I 1 What is meant by statistical quality control? Discuss briefly its need and utility in Industry.

2 Discuss the construction of P-chart when all the samples are of same size. How is the procedure modified for variable sample size?

3 Explain the following terms :
i) Chance and assignable causes ii) control charts
iii) 3σ control limits

4 Distinguish between defect and defective. Explain the construction of C-chart.

II 5 Explain the following terms :
i) Average Outgoing Quality Limit (AOQL)
ii) Producer's and consumer's risk iii) OC-curve

6 What do you understand by sampling inspection plans. How are they used in controlling the quality of manufactured products?

7 Explain the constant hazard model in reliability analysis.

8 Define and explain failure and density. Explain the procedure to complete failure density.

III 9 Two spare parts X and Y are produced in a batch. Each one has to go through two process A and B. The time required in hours per unit and total time available are given below.

	X	Y	Total hours available
Process A	3	4	24
Process B	9	4	36
Profits	5	6	

Formulate an LPP and solve the problem

Code No. 279

FACULTY OF SCIENCE

B.Sc. II-Semester (CBCS) Examination, May 2017

Subject : Statistics (Practical)

Paper - II

Time : 2 Hours **Max. Marks: 20+5(Record)**

Note: Answer any Two questions. Scientific Calculators are Allowed.

1 In a biochemical experiment 20 insects were put into each of 100 jars and were subjected to fumigant. After three hours, the no. of living insects in each jar was counted and the results were as follows:

No. of insects alive	0	1	2	3	4	5	6	7	8	9
No. of jars	3	8	11	15	16	14	12	11	9	1

Fit an appropriate distribution to the above data.

2 Indian cricket Board had decided to give opportunity in test matches to some cricketers till they make 'K' centuries on the assumption that each cricketer can make only one century in one match. The no. of failures before scoring K^{th} century, for 100 cricketers, are recorded as follows:

No. of failures before K^{th} century	0	1	2	3	4	5
No. of cricketers	52	31	7	5	4	1

Fit a negative binomial distribution.

3 Fit a Normal distribution for the following data:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
No. of students	3	16	50	100	132	110	60	22	6	1

4 Fit a Cauchy distribution for the following data:

Marks	-αto-29	-29to-21	-21to-13	-13to-5	-5to-3	3to11	11to19	19to27	27to35	35 &above
Frequency	12	10	20	38	400	32	20	10	8	0

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ELECTRONICS
I YEAR I SEM

Code No. 7010

FACULTY OF SCIENCE

B.Sc. I-Semester (CBCS) Examination, December 2017

Subject : Electronics

Paper – I : Circuits Analysis

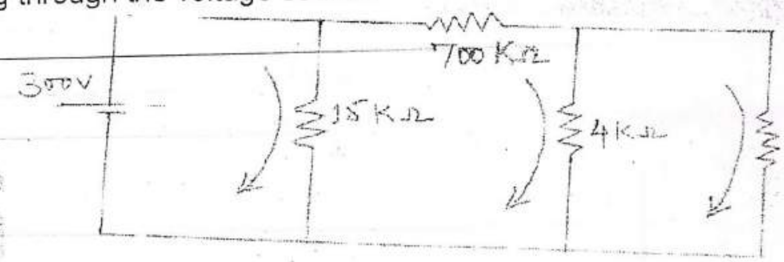
Time : 3 Hours **Max. Marks: 80**

PART – A (5 x 4 = 20 Marks)
(Short Answer Type)
Note : Answer any FIVE of the following questions.

1. Derive the expression for RMS value of AC current.
2. What is complex impedance?
3. State Super position Theorem.
4. State Norton's theorem.
5. Explain different types of filters.
6. Explain the working of RC integrating circuit with neat diagrams.
7. Explain the phenomenon of resonance.
8. Explain in action of fluorescent screen of a CRO.

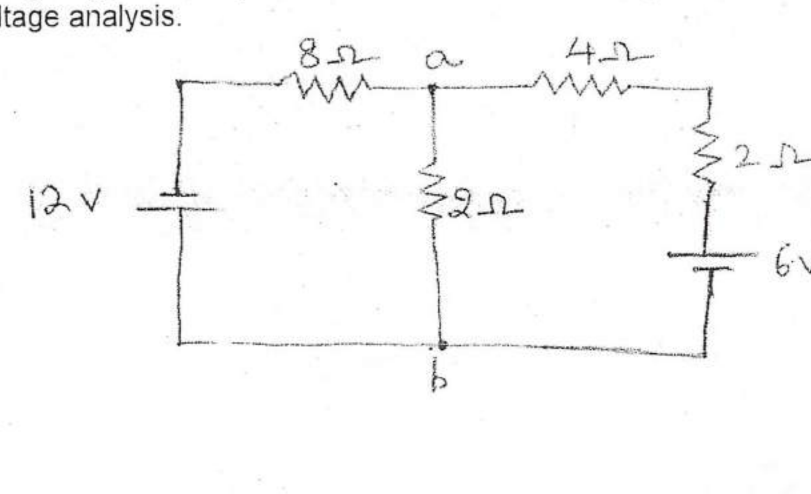
PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)
Note: Attempt ALL the questions.

9. (a) State and prove Kirchoff's current law. For the following circuit. Find the current flowing through the voltage source.



OR

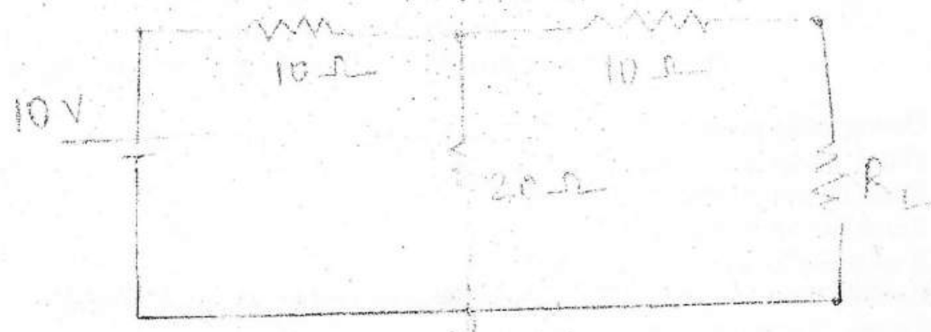
(b) What do you mean by node voltage method of analysis? Explain. Find the voltage V_{ab} between points 'a' and 'b' in the following circuit of the method of node-voltage analysis.



10 (a) State and prove Thevenin's theorem.

OR

(b) State and prove maximum power transfer theorem. Find the value of R_L for maximum power in the following circuit.



11 (a) What is transient response? Discuss the transient response of RC circuit with step input.

OR

(b) What is a high pass filter? Derive an expression for the cutoff frequency of high pass RC circuit with necessary figures.

12 (a) Derive an expression for resonance frequency and quality factor of a series LCR circuit.

OR

(b) Draw the diagram of CRT and briefly explain function of each part.

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Code No. 3072/E

FACULTY OF SCIENCE

B.Sc. III-Semester (CBCS) Examination, November / December 2018

Subject : Mathematics

Paper – III : Real Analysis (DSC)

Time : 3 Hours **Max. Marks: 80**

PART – A (5 x 4 = 20 Marks)
(Short Answer Type)
Note : Answer any FIVE of the following questions.

1 Determine the limit of the sequence $\{s_n\}$, where $s_n = \sqrt{n^2+1} - n$.

2 Let $t_1=1$ and $t_{n+1} = \dfrac{t_n^2+2}{2t_n}$ for $n \geq 1$. Find the lim t_n.

3 If $a_n = \sin\left(\dfrac{n\pi}{3}\right)$ then find lim sup a_n and lim inf a_n.

4 Show that $\sum\limits_{n=2}^{\infty} \dfrac{1}{n(\log n)^p}$ converges if and only if $p > 1$.

5 For n = 0, 1, 2, 3,…. , let $a_n = \left(\dfrac{4+2(-1)^n}{5}\right)^n$. Find lim sup $(a_n)^{\frac{1}{n}}$ lim inf $(a_n)^{\frac{1}{n}}$.

6 Let $f_n(x) = \dfrac{1+2\cos^2 nx}{\sqrt{n}}$. Prove that $\{f_n\}$ converges uniformly to 0 on **R**.

7 Prove that every continuous function f on [a, b] is integrable.

8 Show that $\left| \int_{-2\pi}^{2\pi} x^2 \sin^8(e^x)dx \right| \leq \dfrac{16\pi^3}{3}$.

PART – B (4 x 15 = 60 Marks)
(Essay Answer Type)
Note: Answer ALL the questions.

9 (a) (i) If (s_n) converges to s, (t_n) converges to t, then prove that $(s_n\ t_n)$ converges to s t.

(ii) If (s_n) converges to s and $s_n \neq 0$ for all n, and if $s \neq 0$, then show that $\left(\dfrac{1}{s_n}\right)$ converges to $\dfrac{1}{s}$.

OR

(b) (i) Prove that $\lim\limits_{n\to\infty} a^n = 0$ if $|a| < 1$.

(ii) Prove that $\lim\limits_{n\to\infty} n^{\frac{1}{n}} = 1$.

10 (a) (i) If the sequence (s_n) converges, then prove that every subsequence converges to the same limit.

(ii) State and prove Bolzano-Weierstrass theorem.

OR

(b) If (s_n) converges to a positive real number s and (t_n) is any sequence then prove that $\lim\sup s_n t_n = s \lim\sup t_n$.

11 (a) Let (f_n) be a sequence of functions defined and uniformly Cauchy on a set $S \subseteq \mathbf{R}$. Then prove that there exists a function f on S such that $f_n \to f$ uniformly on S.

OR

(b) Derive an explicit formula for $\sum_{n=1}^{\infty} n^2 x^n$ for $|x| < 1$ and hence evaluate

$$\sum_{n=1}^{\infty} \frac{n^2}{3^n}.$$

12 (a) Let f be a bounded function on [a, b]. If P and Q are partitions of [a, b] and $P \subseteq R$, then prove that

$L(f, P) \le L(f, Q) \le U(f, Q) \le U(f, P)$.

OR

(b) Prove that a bounded function f on [a, b] in Riemann integrable on [a, b] $\Leftrightarrow$ it is Darboux integrable, in which case the values of the integrals agree.

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Code No. 7068 / E

FACULTY OF SCIENCE

B.Sc. III-Semester (CBCS) Examination, December 2017

Subject: Mathematics

Paper – III
Real Analysis

Time: 3 Hours **Max.Marks: 80**

PART – A (5x4 = 20 Marks)
[Short Answer Type]

Note: Answer any <u>FIVE</u> of the following questions.

1 Prove that $\lim_{n\to\infty}\left(n^{\frac{1}{n}}\right) = 1$.

2 Prove that every convergent sequence is a Cauchy sequence.

3 Let $\{s_n\}$ be a sequence converging to s. Then prove that $\lim_{n\to\infty}\sigma_n = s$, where $\sigma_n = \frac{1}{n}(s_1 + s_2 + \ldots + s_n)$.

4 If a series $\sum a_n$ converges, then show that $\lim_{n\to\infty} a_n = 0$.

5 Find the radius of convergence of $\sum_{n=1}^{\infty}\left(\frac{3^n}{n.4^n}\right)x^n$.

6 Let $\{f_n\}$ be a sequence of continuous functions on [a,b] and suppose that $f_n \to f$ uniformly on [a,b]. Then prove that $\lim_{n\to\infty}\int_a^b f_n(x)\,dx = \int_a^b f(x)\,dx$.

7 If f is a bounded function on [a,b], and if P and Q are partitions of [a,b], then prove that $L(f,P) \le U(f,Q)$.

8 Let $f(x) = x$ for rational x and $f(x) = 0$ for irrational x. Calculate the upper and lower Darboux integrals for f on the interval [a,b].

PART – B (4x15 = 60 Marks)
[Essay Answer Type]

Note: Answer <u>ALL</u> the questions.

9 a) i) If $\{s_n\}$ converges to s and $\{t_n\}$ converges to t then prove that s_n+t_n converges to s+t.

ii) Prove that a bounded monotone sequence converges.

OR

b) i) Prove that every Cauchy sequence is bounded.

ii) Prove that every Cauchy sequence of real numbers is convergent

10 a) Let $\{s_n\}$ be a sequence, $t \in \mathbb{R}$. Then prove that there is a subsequence of $\{s_n\}$ converging to t if and only if the set $\{n \in \mathbb{N} : |s_n - t| < \epsilon\}$ is infinite for each $\epsilon > 0$.

OR

b) i) If the sequence $\{s_n\}$ converges, then prove that every subsequence converges to the same limit.

ii) Prove that every sequence has monotone subsequence.

11 a) i) Find the radius of convergence of the series $\sum_{n=1}^{\infty} x^{n!}$

ii) Prove that the uniform limit of continuous functions is continuous.

OR

b) i) State and prove Weierstrass M-test.

ii) Show that if the series $\sum g_n$ converges uniformly on a set s, then

$$\lim_{n \to \infty} \sup \{ | g_n(x) | : x \in s\} = 0.$$

12 a) Define Riemann integral $\int_a^b f(x)\,dx$. If f is a bounded function on [a,b], then prove that $L(f) \leq U(f)$.

OR

b) Prove that a bounded function f on [a,b] is integrable if and only if for each $\epsilon > 0$ there exists a partition P of [a,b] such that $U(f,P) - L(f,P) < \epsilon$.

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Code No. 7068 / E

FACULTY OF SCIENCE

B.Sc. III-Semester (CBCS) Examination, December 2017

Subject: Mathematics

Paper – III

Real Analysis

Time: 3 Hours

Max.Marks: 80

PART – A (5x4 = 20 Marks)
[Short Answer Type]

Note: Answer any FIVE of the following questions.

1 Prove that $\lim_{n\to\infty}\left(n^{\frac{1}{n}}\right) = 1$.

2 Prove that every convergent sequence is a Cauchy sequence.

3 Let $\{s_n\}$ be a sequence converging to s. Then prove that $\lim_{n\to\infty}\sigma_n = s$, where $\sigma_n = \frac{1}{n}(s_1 + s_2 + \ldots + s_n)$.

4 If a series $\sum a_n$ converges, then show that $\lim_{n\to\infty} a_n = 0$.

5 Find the radius of convergence of $\sum_{n=1}^{\infty}\left(\frac{3^n}{n.4^n}\right)x^n$.

6 Let $\{f_n\}$ be a sequence of continuous functions on [a,b] and suppose that $f_n \to f$ uniformly on [a,b]. Then prove that $\lim_{n\to\infty}\int_a^b f_n(x)\,dx = \int_a^b f(x)\,dx$.

7 If f is a bounded function on [a,b], and if P and Q are partitions of [a,b], then prove that $L(f,P) \le U(f,Q)$.

8 Let $f(x) = x$ for rational x and $f(x) = 0$ for irrational x. Calculate the upper and lower Darboux integrals for f on the interval [a,b].

PART – B (4x15 = 60 Marks)
[Essay Answer Type]

Note: Answer ALL the questions.

9 a) i) If $\{s_n\}$ converges to s and $\{t_n\}$ converges to t then prove that s_n+t_n converges to s+t.

ii) Prove that a bounded monotone sequence converges.

OR

b) i) Prove that every Cauchy sequence is bounded.

ii) Prove that every Cauchy sequence of real numbers is convergent

10 a) Let $\{s_n\}$ be a sequence, $t \in \mathbb{R}$. Then prove that there is a subsequence of $\{s_n\}$ converging to t if and only if the set $\{n \in \mathbb{N} : |s_n - t| < \epsilon\}$ is infinite for each $\epsilon > 0$.

OR

b) i) If the sequence $\{s_n\}$ converges, then prove that every subsequence converges to the same limit.

ii) Prove that every sequence has monotone subsequence.

11 a) i) Find the radius of convergence of the series $\sum_{n=1}^{\infty} x^{n!}$

ii) Prove that the uniform limit of continuous functions is continuous.

OR

b) i) State and prove Weierstrass M-test.

ii) Show that if the series $\sum g_n$ converges uniformly on a set s, then

$$\lim_{n \to \infty} \sup \{ |g_n(x)| : x \in s\} = 0.$$

12 a) Define Riemann integral $\int_a^b f(x)\,dx$. If f is a bounded function on [a,b], then prove that $L(f) \leq U(f)$.

OR

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