ODD Semester Theory Examination, 2020-21
(COVID Impacted Session)

This File contains:

Guidelines for setting up of question papers (COVID Impacted Session)

1. All the Question Papers will be of THREE hours duration.
2. There shall be **TWO** questions.
3. **Question 1** will have **12 (TWELVE) parts** out of which **8 (EIGHT) parts** have to be answered by the students.
    - There will be **at least TWO questions** from **each Unit** of the Syllabus.
    - All Parts of this question will be of **Short Answer Type** questions. **Expected solving time** for each part is approximately **8 minutes**, thus giving **64 minutes** for the **Question 1**.

4. **Question 2** will have **10 (Ten) parts** out of which **6 (SIX) parts** have to be answered by the students.
    - There will be **TWO questions** from each Unit of the Syllabus.
    - Parts of this question will be of **Moderate Answer Type** questions. **Expected solving time** for each part is approximately **17 minutes**, thus giving **102 minutes** for the **Question 2**.

5. The question paper setter may, as per his wisdom, add internal choice in any part of the questions.

6. A sample question paper template for **100 Marks** question paper and **70 Marks** question papers is attached for reference outlining the structure of a typical question paper.

7. **Distribution of Marks** is shown in the attached sample template of question paper.
    a. ***For 100 Marks question paper***:
    Question 1: 5 marks * 8 parts = 40 Marks.
    Question 2: 10 marks * 6 parts = 60 Marks.

    b. ***For 70 Marks question paper***:
    Question 1: 3.5 marks * 8 parts = 28 Marks.
    Question 2: 7 marks * 6 parts = 42 Marks.

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Sample Template of Question Paper
For subjects of 100 Marks (3 hours) Question Papers

Important Note: This sample paper has been designed with minimum number of internal choices within all questions. The Question Paper Setter may, as per his wisdom, add internal choice in any parts of the questions.

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Subject Code: AAA-000	Roll No.:									

B.Tech.
(SEM I) ODD SEMESTER EXAMINATION 2020-21
SUBJECT NAME

[TIME: 3 hrs.] **[Max. Marks: 100]**

Note: ***Attempt All Questions.***

Q1.	This question contains ***Twelve*** Parts. Answer ***any EIGHT*** parts**.** Each part carries **5 Marks**.	**5 x 8 = 40**
(a)	Explain the following terms. Rate of Convergence, Truncation Error	
(b)	Show at least one scenario through graphical sketch when choice of initial guess in Newton Raphson method may lead to divergence or endless cycle.	
(c)	Performing three iteration of the bisection method, find the one real root of the equation in the interval **[0, 4]**. $x^3 - 3x^2 + 1 = 0$	
(d)	What do you understand by ill-conditioned system of equations?	
(e)	Find the unique polynomial **P(x)** of degree **2** or less using the Lagrange interpolation method such that **P(1) = 1, P(3) = 27, P(4) = 64.**	
(f)	Prove the following relation between forward difference operator and backward difference operator. $\Delta + \nabla = \Delta / \nabla - \nabla / \Delta$	
(g)	Explain the principle of least squares for curve fitting.	
(h)	Express x^2 in terms of Chebyshev polynomials.	
(i)	Write the Trapezoidal Formula to find integration of any given function.	
(j)	Compare the local errors in the Trepezoidal Rule and Simpson's 1/3 rule of integration.	
(k)	Prove that if every number in a sequence is multiplied by a nonzero constant, the moving average is also multiplied by this constant.	
(l)	Define the following terms. Type-II Error, Level of significance	
Q.2.	This question contains ***TEN*** parts. Answer ***any SIX*** parts. Each part carries **10 Marks**.	**10 x 6 =60**
(a)	Perform three iterations of the Newton Raphson method with initial guess of **3** to find the approximate value of cube root of **23**.	
(b)	Obtain the rate of convergence of *Regula- Falsi* method for finding root of a given equation.	

(c) Using Gauss elimination method with partial pivoting, solve the following system of simultaneous equations

$$x + y - z = 2$$
$$2x + 3y + 5z = -3$$
$$3x + 2y - 3z = 6$$

(d) Set up the Successive Over Relaxation (SOR) iteration scheme in matrix form for solving the given system of simultaneous using relaxation parameter $\omega = 1.132$ for equations.

$$4x + 2z = 4$$
$$5y + 2z = -3$$
$$5x + 4y + 10z = 2$$

(e) Using the principle of least squares fit, find an equation of the form **y = a + bx** that fits best the given data.

x	**1**	**2**	**3**	**4**
y	**21**	**11**	**7**	**6**

(f) Determine the step size that can be used in the tabulation of a function **$f(x) = e^{3x}$** in the interval **[0,1]** at equally spaced points so that truncation error of quadratic interpolation is less than **10^{-4}**.

(g) Evaluate the following integral using Simpson's 1/3 method taking stepzize h= 0.5.

$$I = \int_0^2 dx / (x^2+2x+10)$$

(h) Solve the following differential equation using classical Runge-Kutta fourth order method to find numerical solution at **x = 0.8** correct to three decimal places. Assume step length **h=0.2**.

$$y'(x) = (x+y)^{1/2} ; \; y(0.4) = 0.41$$

(i) Following table shows the observed and expected frequencies in tossing a dice 120 times. Test the hypotheses that dice is fair, using significance level of 0.05.

Face	**1**	**2**	**3**	**4**	**5**	**6**
Observed Frequency	25	17	15	23	24	16
Expected Frequency	20	20	20	20	20	20

Given that for 5 degrees of freedom, value of chi-square (χ^2) at 0.95 and at 0.05 are 11.1 and 1.15 respectively.

(j) Discuss various types of frequency charts.

Sample Template of Question Paper
For subjects of 70 Marks (3 hours) Question Papers

Important Note: This sample paper has been designed with minimum number of internal choices within all questions. The Question Paper Setter may, as per his wisdom, add internal choice in any parts of the questions.

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Subject Code: AAA-000	Roll No.:									

B.Tech.
(SEM I) ODD SEMESTER EXAMINATION 2020-21
SUBJECT NAME

[TIME: 3 hrs.] **[Max. Marks: 70]**

Note: ***Attempt All Questions.***

Q1.	This question contains ***Twelve*** Parts. Answer ***any EIGHT*** parts**.** Each part carries **3.5 Marks**.	**3.5 x 8 = 28**
(a)	Explain the following terms. Rate of Convergence, Truncation Error	
(b)	Show at least one scenario through graphical sketch when choice of initial guess in Newton Raphson method may lead to divergence or endless cycle.	
(c)	Performing three iteration of the bisection method, find the one real root of the equation in the interval **[0, 4]**. $x^3 - 3x^2 + 1 = 0$	
(d)	What do you understand by ill-conditioned system of equations?	
(e)	Find the unique polynomial **P(x)** of degree **2** or less using the Lagrange interpolation method such that **P(1) = 1, P(3) = 27, P(4) = 64.**	
(f)	Prove the following relation between forward difference operator and backward difference operator. $\Delta + \nabla = \Delta / \nabla - \nabla / \Delta$	
(g)	Explain the principle of least squares for curve fitting.	
(h)	Express x^2 in terms of Chebyshev polynomials.	
(i)	Write the Trapezoidal Formula to find integration of any given function.	
(j)	Compare the local errors in the Trepezoidal Rule and Simpson's 1/3 rule of integration.	
(k)	Prove that if every number in a sequence is multiplied by a nonzero constant, the moving average is also multiplied by this constant.	
(l)	Define the following terms. Type-II Error, Level of significance	
Q.2.	This question contains ***TEN*** parts. Answer ***any SIX*** parts. Each part carries **7 Marks**.	**7 x 6 =42**
(a)	Perform three iterations of the Newton Raphson method with initial guess of **3** to find the approximate value of cube root of **23**.	
(b)	Obtain the rate of convergence of *Regula- Falsi* method for finding root of a given equation.	

(c) Using Gauss elimination method with partial pivoting, solve the following system of simultaneous equations

$$x + y - z = 2$$
$$2x + 3y + 5z = -3$$
$$3x + 2y - 3z = 6$$

(d) Set up the Successive Over Relaxation (SOR) iteration scheme in matrix form for solving the given system of simultaneous using relaxation parameter $\omega = 1.132$ for equations.

$$4x + 2z = 4$$
$$5y + 2z = -3$$
$$5x + 4y + 10z = 2$$

(e) Using the principle of least squares fit, find an equation of the form **y = a + bx** that fits best the given data.

x	**1**	**2**	**3**	**4**
y	**21**	**11**	**7**	**6**

(f) Determine the step size that can be used in the tabulation of a function **$f(x) = e^{3x}$** in the interval **[0,1]** at equally spaced points so that truncation error of quadratic interpolation is less than **10^{-4}**.

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Observed Frequency	25	17	15	23	24	16
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Given that for 5 degrees of freedom, value of chi-square (χ^2) at 0.95 and at 0.05 are 11.1 and 1.15 respectively.

(j) Discuss various types of frequency charts.