



Note: For each question 12 marks.

Q1// Explain with example the relation among continuous, differentiable and integrable functions.

Q2//1- Let $f: [a, b] \rightarrow \mathbb{R}$ be a continuous function on $[a, b]$ and differentiable on (a, b) , then prove there is a point $c \in (a, b)$ such that $f(b) - f(a) = (b - a)f'(c)$.

2- Give example to explain above.

Q3// Let $f: [0, 1] \rightarrow \mathbb{R}$ be a function such that $f(x) = x \quad \forall x \in [0, 1]$, then:

1- If we take the partition $p = \{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\}$, is f is R-integrable on p ?

2- Evaluate $\int_0^1 x dx^2$

Q4// 1- Let $f: [0, 2] \rightarrow \mathbb{R}$ be function such that $f(x) = 3x, \forall x \in [0, 2]$, evaluate $\int_0^2 3x dx$?

2- Prove if f and h are R-integrable on $[a, b]$, then fh is also R-integrable on $[a, b]$.


3- Prove every subset of a negligible set is negligible.

Q5// 1- Give example for the following:


a- Integrable function is not monotonic. b- Integrable function is not continuous.

c- Set has not measure, but has outer measure.

2- If we have the set $S = (0, 1) \cup \{1, 2, 3\}$ then, what the measure and outer measure of S ?


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Good Luck


Lecture
Dr. Amer Himza Almyaly



((Assessment of the final exam for the second semester))
Academic year 2017-2018

31.05.2018
45

Q1\\ Use Adams predictor-corrector method third order to solve :

$$y' = \frac{y^2}{1+t}, \quad h = 0.25, \quad 1 \leq t \leq 2, \quad \text{exact solution equation is } y(t) = \frac{-1}{\ln(1+t)}.$$

Q2\\ Use Euler's modified method to solve -----(7 marks)

$$y' = \frac{1+t}{1+y}, \quad 1 \leq t \leq 2, \quad \text{exact solution equation is } y(t) = \sqrt{t^2 + 2t + 6} - 1.$$

Find the error values at each step.

Q3\\ Use composite Trapezoidal rule to solve -----(7 marks)

$$\int_{-0.5}^{0.5} \cos^2(x) dx, \quad n = 4, \quad \text{find the error value that occurred.}$$

Q4\\ Use Least square method to fit the following data of the form $y = be^{ax}$ -----(5 marks)

x	1	1.25	1.5	1.75	2
y	5.1	5.79	6.53	7.45	8.46


Q5\\ Approximate the solution of the following PDE -----(7 marks)

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0, \quad 0 \leq x \leq 1, \quad 0 \leq y \leq 2$$

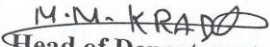
$$u(x,0) = x^2, \quad u(x,2) = (x-2)^2, \quad u(0,y) = y^2, \quad u(1,y) = (y-1)^2, \quad h = k = 0.5$$

Q6\\ Detremine the value of h that ensure the approximation error of less than 0.00002 -----(7 marks)

when approximate $\int_0^{\pi} \sin(x) dx$ by composite Simpson's rule, determine the value of n .


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((Assessment of the final exam for the second semester))

45

Academic year 2017-2018

Q1: Let x_1, x_2, \dots, x_n represent measurements of a random sample drawn from a population with exponential distribution with parameter θ . Find the most powerful critical region with test size α to test $H_0 : \theta = \theta_0$ against $H_1 : \theta = \theta_1 < \theta_0$, then find the power of test. (10 Marks)

Q2: Derive the confidence interval limits for the normal distribution when the variance of this distribution σ^2 is known, and draw the acceptance and rejection regions. (10 Marks)

Q3: (a) Derive the Neyman-Pearson theorem.
(b) What is the relationship between the type I error and the power of test. Explain mathematically this relationship. (10 Marks)

Q4: Let x_1, x_2, \dots, x_n be a random sample drawn from a population with probability density function:


$$f(x, p) = \begin{cases} \theta x^{\theta-1}, & \text{if } 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$

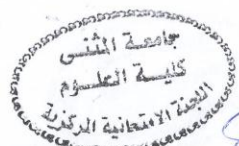
where $\theta > 0$ is an unknown parameter, what is a $100(1 - \alpha)\%$ approximate CI for the parameter θ if the sample size is large? (10 Marks)

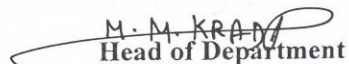
Q5: Let x_1, x_2, \dots, x_{12} be a random sample drawn from a normal population with $\mu = 0$ and variance is σ^2 . What the most powerful test with test size 0.025 for testing $H_0 : \sigma^2 = 10$ versus $H_1 : \sigma^2 = 5$ using Neyman- Pearson theorem? (10 Marks)

Q6: If we have a ransom sample drawn from a Poisson distribution with parameter λ . Using the factorization theorem, show that $\sum_{i=1}^n$ is sufficient indicator for the parameter λ . (10 Marks)

Best of luck


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Note: For every question 10 marks

Q1// Give a reason for the following:

- 1- $Z_8/\{0,4\} \cong Z_4$?
- 2- let $(F, +, \cdot)$ be a field then $F[x]$ is not field?
- 3- $(\mathbb{Z}, +, \cdot)$ is Noetherian but is not Artinian?
- 4- Every prime ideal is irreducible.
- 5- The polynomial $f(x) = x^2 - 2$ is irreducible over \mathbb{Q} .

23.05.2018

Q2//1- Prove every artinian integral domain ring is a field?

2- Define and give examples for reducible and irreducible polynomial, then prove if the polynomial $f(x) \in F[x]$ of degree 2 or 3 is reducible in F iff it has a root in F . Hint: F is field.

Q3// Prove the following are equivalent? Only Two.

- 1- $(R, +, \cdot)$ satisfy A.c.c on ideals.
- 2- Every a nonempty collection of ideals has a maximal element.
- 3- Every ideal of R is finitely generated.

Q4// 1- The polynomial $f(x) \in R[x]$ is divisible by $x-a$ iff a is root of $f(x)$.

2- If we have two submodules N_1 and N_2 of an R -module M , what the difference between $N_1 + N_2$ and $N_1 \cup N_2$?

Q5// 1- Prove every isomorphic image of a skew-field is a skew-field?

2- Let $(R, +, \cdot)$ be a Noetherian ring then prove every proper ideal in $(R, +, \cdot)$ is a finite intersection of irreducible ideals.

Q6// The polynomial $f(x) = x^4 - 1$, how many roots in polynomial rings $Z[x]$, $C[x]$ and $Z_6[x]$? Hint C is complex number set.

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Good Luck

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Subject: Partial Differential
Equations II

Stage: 3rd class

Date: / /2018

Time : 3 hours

10.06.2018

((Assessment of the final exam for the second semester))

45

Academic year 2017 -2018

Q1// Solve $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$, $0 < x < 50$, $t > 0$, with
 $u(0, t) = 6$, $u(50, t) = 12$, $u(x, 0) = 5x^2$, then find $u(1, 4)$.
***** (8 marks)

Q2// Determined the type of the following PDEs and solve it.
a) $(1 + q)^2 r - 2(1 + p + q + pq)s + (1 + p)^2 t = 0$

b) $r - 2yp + y^2 z = (y - 2)e^{2x+3y}$
***** (12 marks)

Q3// Find a solution of the following PDE

$$\nabla^2 u = \frac{1}{r} \frac{\partial}{\partial r} \left(r \frac{\partial u}{\partial r} \right) + \frac{1}{r^2} \frac{\partial^2 u}{\partial \theta^2} = 0 ; |u(0, \theta)| < \infty \text{ and } u(a, \theta) = f(\theta)$$

$$\text{with } u(r, -\pi) = u(r, \pi) ; \frac{\partial u}{\partial r}(r, -\pi) = \frac{\partial u}{\partial r}(r, \pi)$$

***** (10 marks)

Q4// Explain how to solve the Dirichlet initial boundary value problem

$$u_{tt} = c^2 u_{xx} + F(t, x), \quad u(0, x) = f(x),$$

$$u_t(0, x) = g(x), \quad u(t, 0) = u(t, l) = 0$$

for the wave equation subject to the external forcing on $[0, l]$.

***** (10 marks)

Q5// Reduce the equation to canonical form and solve it.

$$y^2 r - 2xys + x^2 t = \frac{y^2}{x} p + \frac{x^2}{y} q$$

***** (10 marks)

Q6// Solve $u_{tt} + 3u_t + u = u_{xx}$, $0 < x < 1$, $t > 0$, with

$$u(0, t) = 0, u(1, t) = 0 ; u(x, 0) = 0, u_t(x, 0) = x \sin(2\pi x)$$

***** (10 marks)

$$\text{note: } p = \frac{\partial z}{\partial x}, \quad q = \frac{\partial z}{\partial y}, \quad r = \frac{\partial^2 z}{\partial x^2}, \quad s = \frac{\partial^2 z}{\partial x \partial y}, \quad t = \frac{\partial^2 z}{\partial y^2}$$

Good Luck

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