Roll No ____________________ [Total No. of Pages : 2

PG4S-022-B-23

M.Sc. IV Semester Degree Examination

ENVIRONMENTAL SCIENCE

Environmental Law, Audit, EIA and Occupational Health

Paper : SCT 4.1

(CBCS Scheme)

Time : 3 Hours **Maximum Marks :80**

Instruction to Candidate:

Answer **ALL** sections, Section-A is compulsory.

SECTION - A

Answer **ALL** the following. **(10×2=20)**

1. a) Sustainable development
   b) Copyright
   c) Genetic waste
   d) E-waste
   e) Water audit
   f) Waste minimization
   g) EIS
   h) Ad-hoc method
   i) Accident hazard
   j) Industrial hygiene

SECTION - B

Answer any **Six** of the following. **(6×5=30)**

2. Explain the intellectual property right.
3. Write a note on the environmental protection act 1986.
4. Describe the biomedical waste management.
5. Explain the objectives of environmental audit.
6. Write a note on health and safety audit.
7. Explain the merits and demerits of EIA.
8. Describe the scope of EIA.
9. Explain the social and legal reasons for accident prevention.

SECTION - C

Answer any **Three** of the following. **(3×10=30)**

10. Explain the polluter pay principle and precautionary principle.
11. Describe the water (prevention and control of pollution) Act 1974.
12. Explain the on-site and post-audit activities.
13. Describe the checklist and matrix method.
14. Explain the environmental factors and their effects on health workers and control measures.

Roll No ______________________ [Total No. of Pages : 2

PG4S-021-B-23

M.Sc. IV Semester Degree Examination

ENVIRONMENTAL SCIENCE

Solid and Hazardous Waste Management

(CBCS Scheme)

Paper : HCT - 4.2

Time : 3 Hours **Maximum Marks :80**

Instruction to Candidate:

Answer **ALL** sections, Section-A is compulsory.

SECTION - A

Answer **ALL** the following. **(10×2=20)**

1. a) Rubbish

b) Rapid Composting

c) Hazardous waste

d) In-situ bioremediation

e) Xenobiotics

f) Leachate

g) Land farming

h) Biomethanation

i) Wet air oxidation

j) Infectious waste

SECTION - B

Answer any **Six** of the following. **(6×5=30)**

2. Explain the impact of an indiscriminate disposal of solid waste.

3. Explain methods of thermo chemical conversion of solid waste.

4. Explain the cirteria for site selection and site characteristics of landfill site.

5. Write a note on incineration and pyrolysis.

6. Discuss the concept of waste minimization.

7. Write a note on collection and storage of hazardous waste.

8. Explain the guidelines for disposable hazardous waste.

9. Explain the E-waste disposable strategies.

SECTION - C

Answer **Three** of the following. **(3×10=30)**

10. Explain the status of municipal solid waste in Indian cities.
11. Discuss on conversion of organic solid waste into organic manure by composting and vermicomposting.
12. Explain the classification and characterization of hazardous waste.
13. Discuss in detail the remediation of contaminated site.
14. Describe the treatement and disposal of biomedical waste management in India.

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Roll No ____________________ [Total No. of Pages : 2

PG4S-025-B-23

M.Sc. IV Semester Degree Examination
MATHEMATICS
Computational Numerical Methods - II
Paper : HCT 4.3

Time : 3 Hours **Maximum Marks :80**

Instructions to Candidate:

1) Answer any **five** full questions.
2) **All** questions carry equal marks.

1. a) Describe Eulers method for solving initial value problem $y' = f(x, y)$ with $y(x_0)=y_0$. **(8)**

b) Use Runge-Kutta fourth order method to approximate y at x=0.2, given that y(0)=1 and $y'=x+y^2$ (use the step size h=0.1) **(8)**

2. a) Describe Runge-Kutta method for solving simultaneous first order differential equations and hence solve

$y'' = xy' - y; y(0) = 3, y'(0) = 0$ and find $y(0.1)$. **(8)**

b) Use Milne's method to find $y(0.3)$ from $y' = x^2 + y^2$; $y(0) = 1$. Find the initial values $y(-0.1)$, $y(0.1)$ and $y(0.2)$ from the Taylors series method. **(8)**

3. a) Describe Adam's-Bashforth predictor corrector method of solving an initial value problem $y' = f(x, y)$ with $y(x_0)=y_0$. **(8)**

b) Write the classification of general second order partial differential equation and discuss the classificaion of physical problems. **(8)**

4. a) Derive explicit finite difference scheme to solve general parabolic partial differential equation. **(8)**

b) Use implicit finite difference Scheme to solve the IBVP $u_t=u_{xx}+(x-2)u_x-3u$ with initial condition $u(x,0) = x^2 - 4x + 5, 0 \le x \le 4, t > 0$; and the boundary conditions $u(0,t)= u(4,t)=5e^{-t}$, $t>0$. **(8)**

5\. a) Use crank-Nicholson method to solve $u_t = u_{xx}$ with $u(x,0) = \sin \pi x;\ 0 \le x \le 1; u(0,t) = u(1,t) = 0$, for one time step. **(8)**

b) Use ADI method to solve upto 2 levels of time of $\frac{\partial u}{\partial t} - \frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2}$ with the initial condition $u(x,y,0) = \sin \pi x \sin \pi y, \begin{matrix} 0 \le x \le 1 \\ 0 \le y \le 1 \end{matrix}$ and boundary conditions

$$\left.\begin{matrix} u(x,y,t) = 0 \ for\ x = 0\ and\ x = 1 \\ u(x,y,t) = 1\ for\ y = 0\ and\ y = 1 \end{matrix}\right\} for\ t > 0$$

Take $h = ⅓$, K=1 so that $A = \frac{1}{9}$. **(8)**

6\. a) Derive standard five-point formula and diagonal five - point formula to solve the Laplace equation $u_{xx}+u_{yy}=0$. **(8)**

b) Solve the Laplace equation $u_{xx}+u_{yy}=0$ with the boundary conditions $u(0,y)=0$, $u(x,0)=0$ $u(1,y)=100y$, $u(x,1)=100x$ by dividing the region into square mesh with a grid spacing of $h=0.25$. **(8)**

7\. Solve $u_{xx} + u_{yy} = 9u : \begin{matrix} 0 \le x \le 1 \\ 0 \le y \le 1 \end{matrix}$ with u satisfying the above equation at every point inside the square and is subject to the bounadry conditions

$u=x$ at $y=0$
$u=x+1$ at $y=1$

$$\left.\begin{matrix} \frac{\partial u}{\partial x} = 2u - y \quad at\ x = 0 \\ u = 2 \quad at\ x = 1 \end{matrix}\right\} 0 < y < 1 \text{ take } h = ⅓.$$ **(16)**

8\. a) Describe the implicit finite difference method to solve hyperbolic partial differential equation. **(8)**

b) Write a note on Galerkin method. **(8)**

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Roll No ____________________ [Total No. of Pages : 2

PG4S-023-B-23

M.Sc. IV Semester Degree Examination

MATHEMATICS

Measure Theory

Paper : HCT 4.1

Time : 3 Hours **Maximum Marks :80**

Instruction to Candidate:

1) Answer any five full questions.
2) All questions carry equal marks.

1. a) Define an outer measure. Let x be a space of atleast two points and $x_0 \in X$. For each $A \subset X$, defined $\mu(A) = \begin{cases} 0 \text{ if } x_0 \notin A \\ 1 \text{ if } x_0 \in A \end{cases}$

Then prove that μ is an outer measure. **(8)**

b) Prove that the union and intersection of two outer measurable sets is measurable. **(8)**

2. a) Show that an open set in a metric space is measurable with respect to any outer measure. **(8)**

b) Define exterior and interior measure of a set. Show that $m_e(A) \geq m_i(A)$ for any Set A. **(8)**

3. a) If E_1 and E_2 are measurable then prove that $E_1 \cup E_2$ is measurable. What do you say about $E_1 \cap E_2$ is measurable? Justify your answer. **(8)**

b) State and prove the second fundamental theorem. **(8)**

4. a) If f is a measurable function defined over a measurable set E. Let 'C' be any real number then show that cf, f+c, $|f|$, f^2 are measurable functions. **(8)**

b) Show that a continuous function defined in a closed interval is measurable. **(8)**

5. a) Let $<f_n>$ be a sequence of functions which converges in measure to the function f on a measurable set E. Then prove that there exists a subsequence which also converges to the function f almost everywhere. **(8)**

b) Define convergence in mean. If $< fn >$ be a sequence of integrable functions which converge in mean to a function f_1 then show that $f_n \to f$ in measure also. **(8)**

6. a) If a function f is absolutely continuous in an interval and $f'(x)=0$ a.e. then prove that 'f' is a constant function. **(8)**

b) Define a function of bounded variation. If $f(x)$ is continuous and integrable function and $F(x)=\int_a^x f(t)dt+F(a)$ then prove that $F'(x)=f(x)$ a.e. **(8)**

7. a) Define an absolutely continuous function. If $f(x)$ and g(x) are obsolutely continuous functions then prove that their sum, difference and product are also obsolutely continuous function. **(8)**

b) Define an indefinite integral of a function. Prove that an indefinite integral is an absolutely continuous function. **(8)**

8. a) Define a signed mesure. If ν is a signed measure on a measurable space (X,A). Then prove that there exists a positive set P and a negative set Q such that $P\cap Q=\phi,\ X=P\cup Q$ where A being $\sigma-$algebra of subsets of X. **(8)**

b) Let (x,A,μ) be a $\sigma-$finite measure space and ν be a $\sigma-$finite measure defined on A. Then prove that there exists two uniquely determined measures r_0 and r_1 such that $r=r_0+r_1$ and $r_0\perp\mu,\ r_1<<\mu$. **(8)**

Roll No ______________________ [Total No. of Pages : 2

PG4S-027-B-23

M.Sc. IV Semester Degree Examination

MATHEMATICS

Fluid Mechanics - II

Paper : SCT 4.1

Time : 3 Hours **Maximum Marks :80**

Instruction to Candidates:

1) Answer any five questions.
2) All questions carry equal marks.

1. a) Derive the relation between stresses and rate of deformation. **(8)**

b) Derive Navier-stokes equation for a viscous fluid. **(8)**

2. Derive the energy equation. **(16)**

3. a) Prove that any problem can be expressed in the form of the relationship between a group of variables i.e, $f(v_1,v_2,.....v_r,....v_n)=0$ where f denotes a function of some variables v_i. **(8)**

b) Explain three different types of similarities. **(8)**

4. a) Define Froude number, Eulers number, Mach number and Reynolds number. **(8)**

b) Show that by means of dimensional analysis that the thrust T of a propeller is given by $T=\rho d^2v^2\phi\left(\frac{vd\rho}{\mu},\frac{dn}{v}\right)$ where ρ is the fluid density, μ its viscosity, d is the diameter of the propeller, v is the speed of advance and n is the revolution per second. **(8)**

5. a) Derive the drag coefficient for plane foiseuille flow. **(8)**

b) Explain the temperature distribution for the plane couette flow. **(8)**

6. a) Derive the flux $Q=\frac{\pi G}{4\mu}\frac{a^3b^3}{a^2+b^2}$ for the fluid over the area of the elliptic cross-section. **(8)**

b) Derive the flux for the steady flow in pipes of rectangular section in the form,

$$Q=\frac{4c}{3\mu}ab^3-\frac{c}{\mu}\frac{256b^4}{\pi^5}\Sigma\frac{1}{(2n+1)^5}\tanh\{(2n+1)(\pi a/2b)\}.$$ **(8)**