NETAJI SUBHAS OPEN UNIVERSITY

স্নাতকোত্তর পাঠক্রম **(P. G.)**

অনুশীলন পত্র **(Assignment) :** জুন, ২০২০ **(June, 2020)**

MATHEMATICS

Paper - 7B : Integral Equations and Generalised Functions

পূর্ণমান : ৫০ **QUESTION PAPER CUM ANSWER BOOKLET** মানের গুরুত্ব : ২০%

(Full Marks : 50) (Weightage of Marks : 20%)

পরিমিত ও যথাযথ উত্তরের জন্য বিশেষ মূল্য দেওয়া হবে। অশুদ্ধ বানান, অপরিচ্ছন্নতা এবং অপরিষ্কার হস্তাক্ষরের ক্ষেত্রে নম্বর কেটে নেওয়া হবে। উপান্তে প্রশ্নের মূল্যমান সূচিত আছে।

Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.

Name (in Block Letter) : ....

Enrolment No.

Study Centre Name : .... Code : ....

To be filled by the Candidate	Serial No. of question answered													TOTAL
For Evaluator's only	Marks awarded													

Q.P. Code : **PA/4/VIIB**

PG-Sc.-AP-17110

Signature of Evaluator with Date

NETAJI SUBHAS OPEN UNIVERSITY

স্নাতকোত্তর পাঠক্রম **(P. G.)**

STUDENT'S COPY

অনুশীলন পত্র **(Assignment) :** জুন, ২০২০ **(June, 2020)**

MATHEMATICS

Paper - 7B : Integral Equations and Generalised Functions

Name (in Block Letter) : ....

Enrolment No.

Study Centre Name : .... Code : ....

Q.P. Code : **PA/4/VIIB**

PG-Sc.-AP-17110

Received Answer Booklet
Signature with seal by the Study-Centre

জরুরি নির্দেশ / Important Instruction

আগামী শিক্ষাবর্ষান্ত পরীক্ষায় **(T.E. Exam.)** নতুন ব্যবস্থা অর্থাৎ প্রশ্নসহ উত্তর পুস্তিকা **(QPAB)** প্রবর্তন করা হবে। এই নতুন ব্যবস্থার সঙ্গে পরীক্ষার্থীদের অভ্যস্ত করার জন্য বর্তমান অনুশীলন পত্রে নির্দেশ অনুযায়ী প্রতিটি প্রশ্নের উত্তর নির্দিষ্ট স্থানেই দিতে হবে।

New system *i.e.* Question Paper Cum Answer Booklet (QPAB) will be introduced in the coming Term End Examination. To get the candidates acquainted with the new system, assignment answer is to be given in the specified space according to the instructions.

Detail schedule for submission of assignment for the PG Term End Examination June, 2020

1.	Date of Publication	: 20/06/2020
2.	Last date of Submission of answer script by the student to the study centre	: 19/07/2020
3.	Last date of Submission of marks by the examiner to the study centre	: 16/08/2020
4.	Date of evaluated answer scripts distribution by the study centre to the students (Students are advised to check their assignment marks on the evaluated answer scripts and marks lists in the study centre notice board. If there is any mismatch / any other problems of marks obtained and marks in the list, the students should report to their study centre Co-ordinator on spot for correction. The study centre is advised to send the corrected marks, if any, to the COE office within five days. No changed / correction of assignment marks will be accepted after the said five days.)	: 23/08/2020
5.	Last date of submission of marks by the study centre to the Department of C.O.E. on or before	: 31/08/2020

এখানে কিছু লিখবেন না

Do Not Write Anything Here

(Symbols / Notations have their usual meanings.)

Answer Question No. 1 and any *four* from the rest.

1. Answer any *five* questions : $2 \times 5 = 10$

a) Use Laplace transform to solve $\int_0^x \sqrt{x-t}\,\phi(t)\mathrm{d}t = x^{5/2}, x > 0$.

b) Show that the integral equation

$$\phi(x) - \int_0^1 (5x^2 - 3)t^2\phi(t)\mathrm{d}t = 0,\ 0 < x < 1,$$

has only trivial solution.

c) Reduce the integral equation

$$\phi(x) - \int_0^x \phi(t)\mathrm{d}t = x,\ x > 0$$

to an ordinary differential equation with appropriate initial condition.

d) Use the method of successive approximations to solve $\phi(x) + \int_0^x \phi(t)\mathrm{d}t = 1,\ x > 0$.

e) Show that $y(x) = \cos 2x$ is a solution of the equation

$$y(x) = \cos x + 3\int_0^\pi k(x,t)y(t)\mathrm{d}t,\ 0 < x < \pi$$

where $k(x,t) = \begin{cases} \sin x \cos t, & 0 \le x < t \\ \cos x \sin t, & t < x \le \pi \end{cases}$

f) Obtain an integral equation corresponding to following initial value problem

$$\frac{\mathrm{d}^2 y}{\mathrm{d}x^2} + y = \cos x,\ 0 < x < 1,\ y(0) = y'(0) = y_0.$$

g) Find the first three iterated Kernels of $\phi(x) = 1 + \int_0^x e^{x-t}\phi(t)\mathrm{d}t,\ 0 < x < 1$.

First Answer :

Second Answer :

Third Answer :

Fourth Answer :

Fifth Answer :

2. Solve the following Fredholm integral equation for all values of the parameter λ

$$\phi(x) = 1 + \lambda \int_0^1 (1 - 3xt)\phi(t)\,dt, \; 0 < x < 1.$$ 10

3. a) Use the method of successive approximations to solve

$$u(x) = 2 - \int_0^x (x - t)u(t)\,dt, \; 0 < x < 1.$$

b) Use Laplace transform technique to solve

$$\int_0^x \frac{\phi(t)}{\sqrt{x - t}}\,dt = f(x), \; x > 0, \; f(0) = 0.$$ 10

4. Reduce the following integral equation to a boundary value problem.

$$\phi(x) - \lambda \int_0^x t(1 - x)\phi(t)\,dt - \lambda \int_x^1 x(1 - t)\phi(t)\,dt = x, 0 < x < 1.$$

Use Hilbert-Schmidt theorem to solve the above integral equation. 4 + 6

5. a) Convert the following intial value problem to an integral equation

$$\frac{d^2y}{dx^2} + x\frac{dy}{dx} + y = 0, \; 0 < x < 1,$$

$$y(0) = 1, \; y'(0) = 0.$$

b) Derive an equivalent Fredholm integral equation for the following boundary value problem :

$$\frac{d^2y}{dx^2} + y = x, \; y(0) = 1, \; y(\pi) = \pi - 1, \; 0 < x < \pi.$$ 5 + 5

6. a) Find the first and second iterated kernel of

$$\phi(x) - \lambda \int_0^{\pi/2} \sin(x - t)\phi(t)\,dt = f(x), \; 0 < x < \frac{\pi}{2}.$$

b) Find the resolvent kernel for the integral equation

$$g(s) = f(s) + \lambda \int_{-1}^1 (st + s^2t^2)g(t)\,dt, \; -1 < s < 1.$$ 5 + 5

7. a) Show that the integral equation

$$\phi(x) - \frac{1}{\pi} \int_0^{2\pi} \sin(x + t)\phi(t)\,dt = f(x), \; 0 < x < 2\pi$$

possesses no solution for $f(x) = x$ but possesses infinite solution when $f(x) = 1$.

b) Find the boundary value problem that is equivalent to the integral equation

$$y(x) - \lambda \int_{-1}^1 (1 - |x - t|)y(t)\,dt = 0, \; -1 < x < 1.$$ 5 + 5

First Answer :

Second Answer :

Third Answer :

Fourth Answer :