FTS

E-1

Roll No. 1815111055

APPLIED MATHEMATICS-II

2K5-BS-01

Time : 3 Hrs. M.M. : 100

Note :—

1. *Part 'A' may be attempted in first 6 pages of Answer Sheet.*
   भाग 'क' के सभी उत्तर, उत्तर-पुस्तिका के प्रथम छः पृष्ठों में ही करने हैं।
2. *Part 'B' in rest of the Sheets of Answer Sheet.*
   भाग 'ख' के उत्तर, उत्तर-पुस्तिका के अगले शेष पृष्ठों में लिखिये।
3. *Answers may be given in English or Hindi.*
   प्रश्नों के उत्तर अंग्रेजी अथवा हिन्दी में दीजिये।

PART - A

1. Attempt any TEN questions : $(10 \times 2 = 20)$

(a) Write the set $\{x : x$ is a positive integer and $x^2 < 40\}$ in the roster form.

(b) Write the set $\left\{\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}\right\}$ in the set-builder form.

(c) If A = {1, 2, 3} write the power set P(A) and find n [P(A)].

(d) If R is the set of real numbers and Q is the set of rational numbers, then what is R – Q ?

(e) Write the period of the function $f(x) = \tan \pi x$.

(f) Evaluate $\int 2x \sin(x^2)\, dx$

(g) Evaulate $\int 3x.e^{x^2}\, dx$

(h) Evaulate $\int_2^{-3} (2x^2 + x)\, dx$

(i) Obtain a_0 in the Fourier expansion of $f(x) = |\sin x|$, if $x \in [-\pi, \pi]$.

(j) Determine whether $f(x) = \sin x - \tan 3x$ is an even function or odd function.

(k) Find $L\{3^t\}$.

(l) If $L\{f(t)\} = \frac{1}{s^2 - 4}$ then $f(t) = ?$

(m) Find $L^{-1}\left\{\frac{5}{S+3}\right\}$.

(n) Find $L\{t^3 e^{-2t}\}$.

2. Attempt any Five questions: $(5 \times 4 = 20)$

(a) Let A = {1, 2, 3, 4, 5, 6}, B = {2, 4, 6, 8}. Find A ∩ B and B – A.

(b) Let U = {1, 2, 3, 4, 5, 6}, A = {2, 3} and B = {3, 4, 5}. Find A′, B′, A′ ∩ B′, A ∪ B and hence show that (A ∪ B)′ = A′ ∩ B′.

(c) Evaluate L $\{t \sin t\}$

(d) In a group of 400 people, 250 can speak Hindi and 200 can speak English. How many people can speak both Hindi and English ?

(e) Obtain a_0 in the Fourier expansion of $f(x) = e^{-x}$, if $x \in [0, 2\pi]$.

(f) $\int_0^a x^2 \sqrt{a^2 - x^2}\, dx$

(g) Find $L^{-1}\left\{\frac{1}{S^2 + 8S + 16}\right\}$

(h) Evaluate L $\{3e^{2t} \sin 2t\}$

PART - B

Attempt any three questions: (3 x 20 = 60)

3. (a) Draw appropriate Venn diagram for each of the following :
$(i)\ (A \cup B)'$, $(ii)\ A' \cap B'$, $(iii)\ (A \cap B)'$, $(iv)\ A' \cup B'$.

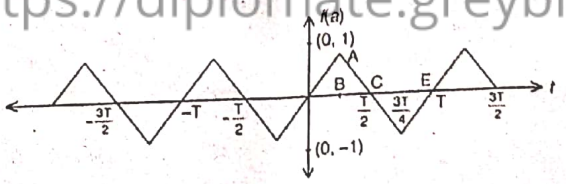
(b) There are 200 individuals with a skin disorder, 120 had been exposed to the chemical C_1, 50 to chemical C_2, and 30 to both the chemicals C_1 and C_2. Find the number of individuals exposed to :
(*i*) Chemical C_1 but not chemical C_2.
(*ii*) Chemical C_2 but not chemical C_1.
(*iii*) Chemical C_1 or chemical C_2.

4. (a) Evaluate $\int x e^{x^2} \sin x^2\, dx$.

(b) Evaluate $\int (3e^x + 5 \sin x \cos x + \tan 2x)\, dx$

5. (a) Apply Simpson's one third rule to obtain an approximate value of the integral, $\int_0^1 \frac{1}{(x^2 + 1)} dx$, by taking 10 equal intervals.

(b) Find the equation of the waveforms in fig. 1.



6. (a) Evaluate : $L\left\{\frac{\sin at}{t}\right\}$

(b) Evaluate : $L^{-1}\left\{\frac{4S + 5}{(S + 3)(S - 1)^2}\right\}$

7. (a) Obtain the Fourier Series to represent the function $f(x) = |x|$ for $-\pi < x < \pi$ and hence deduce that $\frac{\pi^2}{8} = \frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$

(b) Obtain a Fourier Series to represent the following periodic function :

$$f(x) = \begin{cases} 0 \text{ for } 0 < x < \pi \\ 1 \text{ for } \pi < x < 2\pi \end{cases}$$