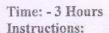
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GANPAT UNIVERSITY

B.Tech. (BM&I) Sem - III CBCS Regular Theory Examination

Subject: 2HS301: Mathematics – III November – December 2012



Total Marks: 70

- 1. All questions are compulsory.
- 2. Write answer of each section in separate answer books.
- 3. Figures to the right indicate marks of questions.

SECTION-I

Oue-1

Answer the following.

(12)

- [A] Prove that Sin hz is an analytic function.
- [B] If f(z) = u + iv is an analytic function of z then find f(z) where $u v = e^{x} (Cosy Siny)$
- Show that $u = y^3 3x^2y$ is a Harmonic function. Find its Harmonic conjugate. Also find corresponding analytic function.

OR

Que-1

Answer the following.

(12)

- [A] Prove that the function $\frac{1}{2}$ is an analytic function.
- [B] Find an analytic function whose real part is $\frac{Sin2x}{(Cosh2y Cos2x)}$
- [C] If f(z) is an analytic function with constant modulus; then show that f(z) is constant.

Que-2

Answer the following.

[A] State & Prove Cauchy's theorem.

(03)

(04)

- [B] Evaluate: $\int_{0}^{2+i} (\overline{z})^2 dz$; along the real axis to 2 and vertically to 2+i.
- [C] Evaluate: $\int \frac{e^{2z}}{(z-1)(z-2)} dz$; where c is the circle: |z|=3. (04)

OR

Que-2

Answer the following.

- [A] Prove that $\int_{C} \frac{dz}{z-a} = 2\pi i$; where c is the circle |z-a| = r (03)
- [B] Evaluate: $\int_{0}^{1+i} \left(x^2 + iy\right) dz$; along the path $y = x^2$. (04)

- [C] Evaluate: $\int_{c}^{3z^2+z} dz$; where c is the circle |z-1|=1
- Que-3 Attempt any three:

(12)

- [A] Expand: $f(z) = \frac{1}{z}$ as a Taylors series about the point z = 1
- [B] Show that $\frac{1}{4z-z^2} = \sum_{n=0}^{\infty} \frac{z^{n-1}}{4^{n+1}}$; when 0 < |z| < 4.
- [C] Expand: $\frac{1}{z(z^2-3z+2)}$ for the regions (1) 0 < |z| < 1 and (2) 1 < |z| < 2.
- [D] Find the Bilinear transformation which maps the points z = 2, i, -2 in to the points w = 1, i, -1

SECTION - II

Que-4 Answer the following.

(12)

- [A] Find a Fourier series to represent the function $f(x) = x^2$; $-\pi \le x \le \pi$. Hence show that $\frac{1}{1^2} + \frac{1}{2^2} + \frac{1}{3^2} + \dots = \frac{\pi^2}{6}$
- [B] Find a Fourier series to represent the function f(x) is given by $f(x) = \begin{cases} -\pi & , & -\pi < x < 0 \\ x & , & 0 < x < \pi \end{cases}$
- [C] Find a half rang sine series for f(x) = 1; $0 \le x \le 2$

OR

Que-4 Answer the following.

(12)

- [A] Find a Fourier series to represent the function $f(x) = e^x$; $0 \le x \le 1$
- [B] Find a Fourier series to represent the function f(x) is given by $f(x) = \begin{cases} -x & , & -\pi < x < 0 \\ x & , & 0 < x < \pi \end{cases}$
- [C] Find the Fourier series for $f(x) = -\pi x^3$, $-\pi < x < \pi$
- Que-5 Answer the following.

[A] Evaluate:
$$L^{-1}\left\{\frac{s}{s^4+s^1+1}\right\}$$
 (03)

[B] Evaluate: (1)
$$L^{-1}\left\{\log\left(\frac{s+1}{s-1}\right)\right\}$$
 (2) $L\left\{t^2\sin^2t\right\}$

[C]	By using Laplace transform evaluate	$e^{-2t}t\sin 4tdt$	(04

OR

Que-5 Answer the following.

- [A] Evaluate: $L\{te^{-4t}\sin 3t\}$. (03)
- [B] Evaluate: (1) $L^{-1} \left\{ \frac{1}{s(s^2 + a^2)} \right\}$ (2) $L \left\{ \frac{1 \cos t}{t} \right\}$ (04)
- [C] Solve differential equation y''' + 2y'' y' 2y = 0, y(0) = 1, y'(0) = 2, y''(0) = 2 (04)

(12)

Que-6 Attempt any three:

- [A] Obtain Picard's second approximate solution of the initial value problem $\frac{dy}{dx} = x^2 + y^2$ for x = 0.4, given that y(0) = 0.
- [B] Find an approximate value of $\sqrt{17}$, correct up to three decimal places, using Newton's Raphson method.
- [C] State convolution theorem and evaluat: $L^{-1}\left\{\frac{1}{(s+1)(s+3)}\right\}$.
- [D] Apply Gauss-Jacobi's method to solve: 6x-y-z=19, 3x+4y+z=26, x+2y+6z=22.

END OF PAPER