

Registration No. :

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Total number of printed pages – 2

B. Tech
BSCM 1205

Third Semester Back Examination – 2014

MATHEMATICS – III

BRANCH (S) : AEIE, AERO, AUTO, BIOMED, BIOTECH, CHEM, CIVIL, CSE, EC, EEE, EIE, ELECTRICAL, ENV, ETC, FASHION, FAT, IEE, IT, MANUFACT, MANUTECH, MECH, MINERAL, MINING, MM, MME, PLASTIC, TEXTILE

QUESTION CODE : L306

Full Marks – 70

Time : 3 Hours

*Answer Question No. 1 which is compulsory and any five from the rest.
The figures in the right-hand margin indicate marks.*



1. Answer the following questions : 2 × 10
- (a) Explain Langle's method.
 - (b) Solve $u_y = 2xyu$ using variable separable method.
 - (c) Explain two dimensional wave equation with initial and boundary conditions.
 - (d) Find the roots of $z^4 = 3$.
 - (e) Find 'a', if the function $f = e^{3x} \sin ay$ is harmonic.
 - (f) State Cauchy-Integral theorem for multiply connected domain.
 - (g) Define uniform convergence of a series.
 - (h) Is the series $\sum_{n=1}^{\infty} \frac{z^n}{\sqrt{n}}$ convergent ?
 - (i) What is Maclaurin's series ?
 - (j) Determine the zeros and its order of $f(z) = (z^2 - 1)^2 (e^z - 1)$.
2. (a) Find the general solution of $(z^2 - 2yz - y^2)p + (xy + zx)q = xy - zx$. 5
- (b) Find the complete solution of the equation $(p^2 + q^2) = (x + y)z$. 5
3. (a) Solve $(D + D')(D + D' - 2) = e^x \sin(x + 2y)$. 5
- (b) Solve $x^2 D^2 - 5Dx + 6y = 11x^2 y^3$. 5

P.T.O.

4. (a) Derive D'Alembert's method to find the solution of wave equation. 5

(b) Find the displacement $u(x, y, t)$ of the equation $\frac{\partial^2 u}{\partial t^2} = c^2 \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right)$,

$u = 0$ on the boundary, $u(x, y, 0) = f(x, y)$ and $u_t(x, y, 0) = g(x, y)$. 5

5. (a) Find the corresponding analytic function whose real part is $u = \ln(z)$. 5

(b) Find the Linear fractional transformation of a unit disk onto the right half plane. 5

6. (a) Evaluate $\int_C z^2 dz$, where C is the boundary of a triangle with vertices $0, 1+i, -1+i$ clockwise. 5

(b) Evaluate $\oint_C \frac{dz}{z^2 - 1}$, $C: |z - 1| = \pi/2$. 5

7. (a) Find the radius of convergence of the following series: 5

(i) $\sum_{n=0}^{\infty} \frac{n+i}{(3n)} (z-i)^{3n+1}$.

(ii) $\frac{(z+2\pi)^n}{(n+1)(n+2)}$.

(b) Find the Laurent series expansion of $f(z) = \frac{z}{z^2 - 9}$ around

(i) $z = 3$,

(ii) in the region $1 < |z+3| < 3$. 5

8. (a) Evaluate: 5

$$I = \int_0^{2\pi} \frac{dx}{2 - \cos x}.$$

(b) Evaluate: 5

$$I = \int_{-\infty}^{\infty} \frac{dx}{(x^2 - 3x + 2)(x^2 + 1)}.$$