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Question Paper Code : 57030

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2014.

Second Semester

Civil Engineering

MA 6251 — MATHEMATICS – II

(Common to all Branches Except Marine Engineering)

(Regulation 2013)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Find the unit normal vector to the surface $x^2 + y^2 = z$ at $(1, -2, 5)$.
2. Prove that $curl(grad\phi) = 0$.
3. Solve the equation $\frac{d^2y}{dx^2} + 2\frac{dy}{dx} + y = 0$.
4. Find the particular integral of the equation $(D^2 - 9)y = e^{-3x}$.
5. Find $L\left[\frac{\sin t}{t}\right]$.
6. Evaluate $L^{-1}\left[\frac{1}{s^2 + 6s + 13}\right]$.
7. Is the function $f(z) = \bar{z}$ analytic?
8. Find the invariant points of $f(z) = z^2$.
9. Evaluate $\int_C \frac{z}{z-2} dz$, where C is (a) $|z| = 1$, (b) $|z| = 3$.
10. State Cauchy's residue theorem.

PART B — (5 × 16 = 80 marks)

11. (a) Verify Gauss divergence theorem for $\vec{F} = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$ taken over the cube bounded by the planes $x = 0, y = 0, z = 0, x = 1, y = 1$ and $z = 1$. (16)

Or

(b) (i) Find the value of n such that the vector $r^n\vec{r}$ is both solenoidal and irrotational. (8)

(ii) Verify Stokes theorem for $\vec{F} = (x^2 - y^2)\vec{i} + 2xy\vec{j}$ in the rectangular region of $z = 0$ plane bounded by the lines $x = 0, y = 0, x = a$ and $y = b$. (8)

12. (a) (i) Solve $(D^2 - 4D + 3)y = \cos 2x + 2x^2$. (8)

(ii) Solve $\frac{d^2y}{dx^2} + a^2y = \tan ax$ using method of variation of parameters. (8)

Or