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Question Paper Code : 11296

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Second Semester

Civil Engineering

MA 1151 – MATHEMATICS – II

(Common to all branches)

(Regulation 2008)

Time : Three Hours

Maximum : 100 Marks

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Find the Laplace transform of $\frac{e^{-2t}}{\sqrt{t}}$
2. Find the inverse Laplace transform of $\frac{1}{s^2 + 2s + 5}$.
3. Show that $\vec{F} = (x + 2y)\vec{i} + (y + 3z)\vec{j} + (x^2 - 2z)\vec{k}$ is solenoidal.
4. Prove that $\nabla \cdot \vec{r} = 3$ and $\nabla \times \vec{r} = 0$, where $\vec{r} = x\vec{i} + y\vec{j} + z\vec{k}$.
5. Find the fixed points of the mapping $w = \frac{5z + 4}{z + 5}$.
6. If $2x - x^2 + ay^2$ is harmonic, then find the value of a.
7. Evaluate $\int_0^{\pi/2} \int_0^{\pi/2} \sin(x + y) dx dy$.

(b) (i) Using Polar co-ordinates evaluate $\int_0^{\infty} \int_0^{\infty} e^{-(x^2 + y^2)} dx dy$ and hence

evaluate $\int_0^{\infty} e^{-x^2} dx$. (8)

(ii) Evaluate $\int_0^{\log 2} \int_0^x \int_0^{x+\log y} e^{x+y+z} dz dy dx$. (8)

15. (a) (i) Expand $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z^2 - 3z + 2)^2} dz$, where C is the circle $|z| = 3$. (8)

(ii) Expand the function $f(z) = \frac{z^2 - 1}{(z + 2)(z + 3)}$ in Laurent's series in the region $|z| > 3$. (8)

OR

(b) (i) Show that $\int_0^{2\pi} \frac{\cos 2\theta d\theta}{1 - 2a \cos \theta + a^2} = \frac{2\pi a^2}{1 - a^2}$, ($a^2 < 1$). (8)

(ii) Evaluate $\int_{-\infty}^{\infty} \frac{x^2 dx}{(x^2 + 1)(x^2 + 4)}$ (8)