Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No ....

MA-220(EE/EI/EX)-CBCS

B.E., III Semester

Examination, June 2020

Choice Based Credit System (CBCS)

Mathematics - III

Time : Three Hours

Maximum Marks : 60

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Test the analyticity of the function $w = e^z$.

b) Using Cauchy's residue theorem, evaluate the real integral

$\int_c \frac{e^{2z}}{z(z-1)} dz$, where c is the circle $|z| = \frac{1}{2}$.

2. a) Find Laplace transform of the following functions:

i) $\frac{\sin t}{t}$ and ii) $te^{at} \sin t$

b) Using convolution theorem to find inverse Laplace transforms of $\frac{s}{(s-a)(s-b)}$

3. Solve by Convolution theorem

$$L^{-1}\left\langle \frac{s^2}{(s^2+a^2)(s^2+b^2)} \right\rangle$$

4. Use Stoke's theorem to evaluate $\int_c F.dr$, where $\vec{F} = (x^2 + y^2)i - 2xyj$ and C is rectangle bounded by $x = \pm a$, $y = 0$ and $y = b$.

5. a) Find poles and residues at them for the function $f(z) = \dfrac{1-2z}{z(z-1)(z-2)}$

   b) Find divergence of $\vec{v} = (y+z)\hat{i} + (z+x)\hat{j} + (x+y)\hat{k}$

6. Evaluate $\int_C \vec{F}.d\vec{r}$, where $\vec{F} = yz\hat{i} + zx\hat{j} + xy\hat{k}$ and C is the curve $\vec{r} = a\cos t\,\hat{i} + b\sin t\,\hat{j} + ct\,\hat{k}$ from $t = 0$ to $t = \dfrac{\pi}{2}$.

OR

Evaluate $\int\int_s \left(\vec{F}.x^n\right) ds$, where $\vec{F} = \left(x + y^2\right)\hat{i} - 2x\hat{j} + 2yz\hat{k}$ and S is the surface of the plane $2x + y + 2z = 6$ in the first octant.

7. a) Find a unit vector normal to the surface $\phi = x^2 + y^2 - z$ at the point P(1, 2, 5).

   b) Find the complete integral of $pq = xy$.

OR

Expand half range cosine series of $\sin\left(\dfrac{\pi x}{l}\right)$ in the range of $0 < x < l$.

8. Find the residue of $f(z) = \dfrac{1-e^{2z}}{z^4}$ at its poles.

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