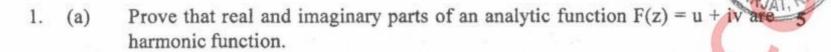
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N.B. :(1) Question no. 1 is compulsory.

- (2) Attempt any three questions out of the remaining five questions.
- (3) Figures to right indicate Full marks.



(b) Find fourier series for $f(x) = |\sin x|$ in $(-\Pi, \Pi)$. 5

Find the Laplace transform of $\int ue^{-3u} \sin 4u du$ (c)

5

5

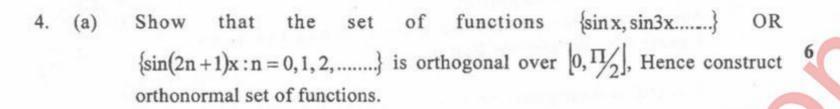
- If $\overline{F} = xye^{2z} \hat{i} + xy^2 \cos z \hat{j} + x^2 \cos xy \hat{k}$, find div \overline{F} and curl \overline{F} . (d)
- Using Laplace transform, solve :-2. (a) $(\theta^2 + 3\theta + 2)y = e^{-2t} \sin t$ where y(0) = 0, y'(0) = 0.

- 6
- Find the directional derivative of $d = x^2 y \cos z$ at $(1, 2, \frac{\Pi}{2})$ in the direction of 6 (b) $\bar{a} = 2\hat{i} + 3\hat{i} + 2\hat{k}$
- Find the fouries series expansion for $F(x) = \sqrt{1 \cos x}$ in $(0, 2\Pi)$, Hence deduce (c) that $\frac{1}{2} = \sum \frac{1}{4^{n^2} - 1}$.
- Prove the $J_{\frac{3}{2}}(x) = \sqrt{\frac{2}{\Pi x}} \left\{ \frac{\sin x}{x} \cos x \right\}$. 6 (a)
 - Evaluate by green's theorem, $\oint (x^2ydx + y^3dy)$ Where C is the closed path formed 6 by y = x, $y = x^2$
 - (i) Find Laplace transform of $\frac{\cos bt \cos at}{t}$ (c)

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(ii) Find Laplace transform of :- $\frac{d}{dt} \begin{bmatrix} \frac{\sin t}{t} \end{bmatrix}$



- (b) Find the imaginary part whose real part is $u = x^3 3xy^2 + 3x^2 3y^2 + 1$
- (c) Find inverse Laplace transform of:-

8

(i) $\log \left(\frac{s^2 + 4}{s^2 + 9} \right)$

(ii)
$$\frac{s}{(s^2+4)(s^2+9)}$$

5. (a) Obtain half range sine series for $f(x) = x^2$ in 0 < x < 3.

6

- (b) A vector field \overline{F} is given by $\overline{F} = (x^2 yz)\hat{i} + (y^2 zx)\hat{j} + (z^2 xy)\hat{k}$ is irrotational and Hence find scalar point function ϕ such that $\overline{F} = \nabla \phi$
- (c) Show that the function $V = e^{X}$ (xsiny + ycosy) satisfies Laplace equation and find its corresponding analytic function and its harmonic conjugate.

8

6

6. (a) By using stoke's theorem, evaluate $\oint_C \left[(x^2 + y^2)\hat{i} + (x^2 - y^2)\hat{j} \right] d\vec{r}$ where 'C' is the boundary of the region enclosed by circles $x^2 + y^2 = 4$, $x^2 + y^2 = 16$.

is transformed into a circle of unity in the w-plane.

- Show that under the transformation $w = \frac{s-4z}{4z-2}$ the circle |z| = 1 in the z-plane
- (c) Prove that $\int J_3(x) dx = \frac{-2J_1(x)}{x} J_2(x)$.

(b)

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