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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)
B.Tech I Year II Semester Regular Examinations May 2019
MATHEMATICS-II
(Common to all branches)

Time: 3 hours

Max. Marks: 60

PART-A

(Answer all the Questions 5 x 2 = 10 Marks)

- 1 a Solve $y(\log y)dx + (x - \log y)dy = 0$. 2M
- b Prove that $\left[J_{\frac{1}{2}}(x) \right]^2 + \left[J_{-\frac{1}{2}}(x) \right]^2 = \frac{2}{\pi x}$. 2M
- c Evaluate $\int_0^1 \int_0^1 \int_0^1 e^{x+y+z} dx dy dz$. 2M
- d Write Cauchy's Riemann equations in Polar form. 2M
- e Find the type of singularity of $\frac{1}{1-e^z}$. 2M

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

- 2 a Solve $r \sin \theta d\theta + (r^3 - 2r^2 \cos \theta + \cos \theta)dr = 0$. 5 M
- b a) Solve $y = 2px + y^2 p^3$. 5 M
- OR**
- 3 a Solve $\frac{dy}{dx}(x^2 y^3 + xy) = 1$ 5M
- b Solve $(px - y)(py + x) = a^2 p$. 5M

UNIT-II

- 4 Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = \log x$. 10M
- OR**
- 5 a Solve $x^2 \frac{d^2 y}{dx^2} - x \frac{dy}{dx} + y = \log x$ 5M
- b Express $J_4(x)$ in terms of $J_0(x)$ & $J_1(x)$ 5M

UNIT-III

- 6 a Find the area lying inside the cardioid $r = a(1 + \cos \theta)$ and outside the circle $r = a$. 5M
- b Evaluate $\iint r \sin \theta dr d\theta$ over the cardioid $r = a(1 - \cos \theta)$ above the initial line. 5M

OR

- 7 By changing order of integration, evaluate $\int_0^{4a} \int_{\frac{x^2}{4a}}^{2\sqrt{ax}} dy dx$. 10M

UNIT-IV

- 8 a If $w = \phi + i\psi$ represents the complex potential for an electric field and $\psi = x^2 - y^2 + \frac{x}{x^2 + y^2}$, determine the function ϕ . 5M
- b Show that the bilinear transformation $w = \frac{2z+3}{z-4}$ maps the circle 5M

$$x^2 + y^2 - 4x = 0 \text{ into the line } 4u + 3 = 0.$$

OR

9 a If $w = f(z)$ is analytic function then prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right) |\operatorname{Re} af(z)|^2 = 2|f'(z)|^2$ 5M

b Find the image of the infinite strip $0 < y < \frac{1}{2}$ under the transformation $w = \frac{1}{z}$ 5M

UNIT-V

10 a Find the Laurent's expansion of $f(z) = \frac{7z-2}{(z+1)z(z-2)}$ in the region $1 < z+1 < 3$. 5M

b Find the residue of the function $f(z) = \frac{1}{(z^2+4)^2}$ where c is $|z-i|=2$ 5M

OR

11 Prove that $\int_0^{\infty} \frac{x^{p-1}}{1+x} dx = \frac{\pi}{\sin px}, 0 < p < 1$. 10M

END