

B.Tech I Year I Semester (R15) Regular & Supplementary Examinations December 2016

MATHEMATICS – I

(Common to CE, EEE, CSE, ECE, ME, EIE and IT)

Time: 3 hours

Max. Marks: 70

PART – A

(Compulsory Question)

- 1 Answer the following: (10 X 02 = 20 Marks)
- (a) Find the orthogonal trajectories of the family of parabolas through the origin and foci on the y – axis.
- (b) Find the complementary function $(D^3 + 2D)y = e^{2x} + \cos(3x + 7)$.
- (c) $x^2 \frac{d^2y}{dx^2} + 3x \frac{dy}{dx} = 0$ has the general solution _____
- (d) Find P.I. $(\theta^2 - 4\theta + 1)^{-1} \sin z$.
- (e) If $u = e^{x+y}$, $v = e^{-x+y}$, then find J.
- (f) Find the radius of curvature at any point of the cardioids $s = 4a \sin \frac{\psi}{3}$.
- (g) $\int_D \int (x^2 + y^2) dx dy =$ _____ D: $y = x, y^2 = x$.
- (h) Evaluate $\int_0^1 dx \int_1^2 dy \int_1^3 xyz dz$.
- (i) $\nabla \times (\nabla \times \bar{A})$ is _____
- (j) Evaluate $\int_C y^2 dx - 2x^2 dy$ along the parabola $y = x^2$ from $(0, 0)$ to $(2, 4)$.

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Solve: $x(x-1) \frac{dy}{dx} - y = x^2(x-1)^3$.

OR

3 Solve: $(D^3 + 2D^2 - 3D)y = xe^{3x}$.

UNIT – II

4 Solve: $(D^2 + a^2)y = \tan ax$ by the method of variation of parameters.

OR

- 5 The deflection y of a strut of length l with one end built-in and other end subjected to the end thrust P , satisfies $\frac{d^2y}{dx^2} + a^2y = \frac{a^2R}{P}(1-x)$. Find the deflection y of the strut at a distance x from the built-in end.

UNIT – III

- 6 (a) If $u = \sin^{-1} \left(\frac{x^2y^2}{x+y} \right)$ then show that $xu_x + yu_y = 3 \tan u$.
- (b) If $u = x + y + z$, $uv = y + z$, $uvw = z$, then prove $\frac{\partial(x,y,z)}{\partial(u,v,w)} = u^2v$.

OR

- 7 (a) Find the points on the surface $z^2 = xy + 1$ nearest to the origin.
- (b) Find the radius of curvature at $(3,3)$ on the curve $x^3 + xy^2 - 6y^2 = 0$.

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UNIT - IV

8 Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dx dy$ by changing the order of integration.

OR

9 Evaluate $\int \int \int xy^2 z dx dy dz$ taken through the positive octant of the sphere: $x^2 + y^2 + z^2 = a^2$.

UNIT - V

10 (a) Find the directional derivative of $f = xy + yz + zx$ in the direction of vector $\bar{i} + 2\bar{j} + 2\bar{k}$ at the point $(1, 2, 0)$.

(b) Find curl \bar{f} where $\bar{f} = \text{grad} (x^3 + y^3 + z^3 - 3xyz)$.

OR

11 Evaluate by Green's theorem $\oint_C (y - \sin x) dx + \cos x dy$ where C is triangle enclosed the lines $y = 0, x = \frac{\pi}{2}, \pi y = 2x$.
