College of Engineering, Pune

End Semester Examination May 2013

F. Y. B. Tech. (All Branches)

MA-102 : Engineering Mathematics-II

Time: 3 Hrs | Max Marks: 50

Instructions:

1. *All questions are compulsory.*
2. *Figures to the right indicate full marks.*
3. *All symbols have their usual meanings.*
4. *Begin a new question on new page and solve all the subquestions together.*
5. *If you use any notations other than standard notations, describe them specifically so that your answers become self explanatory.*

Q.1. Attempt **all** of the following

(a) Evaluate $\int_0^2 x^3\sqrt{2-x}\,dx$. [2]

(b) Sketch the region of integration and evaluate the integral $\int_0^{\pi}\int_0^{x} x\sin y\,dy\,dx$. [2]

(c) Using change of order of integration reduce the triple integral $\int_0^t\int_0^s\int_0^{\tau} f(\sigma)\,d\sigma\,d\tau\,ds$ [2]
to a single integral, where f is integrable function.

(d) Determine the differential equation for the current i in an electrical circuit containing an induction L and a resistance R in a series and acted on by an electromotive force $E\sin\omega t$ and hence find the value of the current at any time t, if initially there is no current in the circuit. [2]

(e) Find the curve through the origin in the xy-plane which satisfies $y'' = 2y'$ and whose tangent at origin has slope 1. [2]

Q.2. (a) Express the integral $\int_0^{\infty}\frac{x^c}{c^x}dx$, in terms of Gamma function, where c is a constant. [2]

(b) Attempt any **Two** of the following.

i. Integrate $f(x,y) = \frac{1}{xy}$ over the square $R = \{(x,y)|1 \le x \le 2, 1 \le y \le 2\}$. [3]

ii. Find the moment of inertia and radius of gyration about the $x-axis$ of a thin plate bounded by the parabola $x = y - y^2$ and the line $x + y = 0$ if $\delta(x,y) = x + y$. [3]

iii. Change the cartesian integral $\int_0^2\int_0^{\sqrt{1-(x-1)^2}}\frac{x+y}{x^2+y^2}\,dy\,dx$ to equivalent polar integral and then evaluate it. [3]

Q.3. (a) Using differentiation under integral sign convert the integral equation $y(x) = e^x + \int_0^x (x-t)y(t)dt$ to the equivalent differential equation. [2]

[P.T.O.]