

10/6/2013
Feb. 2013-(e) 97
Con. 6887-13.

F.E Sem II (R)
App. Maths - II

(REVISED COURSE)

(3 Hours)

GS-5427

[Total Marks : 80

- N.B. : (1) Question No. 1 is compulsory.
(2) Answer any three questions from Question Nos. 2 to 6.
(3) Figures to the right indicate full marks.
(4) Programmable calculators are not allowed.

1. (a) Evaluate $\int_0^1 (x \log x)^4 dx$. 3

(b) Solve $(D^2 - 1)(D - 1)^2 y = 0$. 3

(c) prove that $E = 1 + \Delta = e^{hD}$. 3

(d) Solve $\frac{dy}{dx} = \frac{y+1}{(y+2)e^y - x}$ 3

(e) Change into Polar co-ordinates and Evaluate $\int_0^a \int_0^{\sqrt{a^2-x^2}} (x^2 + y^2) dy dx$. 4

(f) Evaluate $\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{dx dy}{1+x^2+y^2}$ 4

2. (a) Solve $(x^3 y^3 - xy) dy = dx$. 6

(b) Change the order of Integration and Evaluate $\int_0^1 \int_x^{2-x} \frac{x}{y} dy dx$. 6

(c) (i) P.T. $\int_0^{\pi/2} \tan^n x dx = \frac{\pi}{2} \sec \left[\frac{n\pi}{2} \right]$. 4

(ii) Evaluate $\int_0^{\infty} \frac{\log(1+ax^2)}{x^2} dx$, $a > 0$ 4

3. (a) Evaluate $\int_0^1 \int_0^{1-x} \int_0^{1-x-y} \frac{dz dy dx}{(1+x+y+z)^3}$. 6

(b) Find the area using Double integration where the region of integration is bounded by the curves $9xy = 4$ and $2x + y = 2$. 6

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(c) (i) Solve $x^2 \frac{d^2y}{dx^2} - x \frac{dy}{dx} + 4y = \cos(\log y)$. 4

(ii) Solve the equation by method of variation of parameters 4

$$\frac{d^2y}{dx^2} + 3 \frac{dy}{dx} + 2y = e^{e^x}.$$

4. (a) Show that for the parabola $r = \frac{2a}{1+\cos\theta}$ for $\theta = 0$ to $\frac{\pi}{2}$ is $a[\sqrt{2} + \log(1+\sqrt{2})]$. 6

(b) Solve $\frac{d^2y}{dx^2} + 2y = x^2 e^{3x} + e^x - \cos 2x$. 6

(c) Apply Runge-Kutta method of fourth order to find an approximation value of y at $x = 0.2$ if $\frac{dy}{dx} = x + y^2$ given $y = 1$ when $x = 0$ in steps of $h = 0.1$. 8

5. (a) Solve $(2xy^4e^y + 2xy^3 + y) dx + [x^2y^4e^y - x^2y^2 - 3x] dy = 0$. 6

(b) Solve $\frac{dy}{dx} = 2x + y$ with initial conditions $x_0 = 0, y_0 = 0$ by Taylor's method obtain y as series in powers of x . 6

Find approximation value of y for $x = 0.2, 0.4$. Compare your result with exact values.

(c) Evaluate $\int_{-1}^1 \frac{dx}{1+x^2}$ by: 8

(i) Trapezoidal method (ii) Simpson's $\frac{1}{3}$ rd method and (iii) Simpsons $\frac{3}{8}$ th method. Compare result with exact values.

6. (a) In a circuit containing inductance L , resistance R and voltage E . The current i is given by 6

$$L \frac{di}{dt} + Ri = E. \text{ Find current } i \text{ at time } t \text{ if } t = 0, i = 0 \text{ and } L, R, E \text{ are constants.}$$

(b) Evaluate $\iint_R xy \, dx \, dy$ where R is the region bounded by $x^2 + y^2 - 2x = 0$, $y = x$ and $y^2 = 2x$. 6

(c) (i) Find volume of tetrahedron bounded by plane $x = 0, y = 0, z = 0$ and $x + y + z = a$. 4

(ii) Find volume bounded by cone $z^2 = x^2 + y^2$ and Paraboloid $z = x^2 + y^2$. 4