

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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ws Feb. 2013-(c) 98

Con. 6887-GS-5427-13.

2

(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  $(2xy^4 e^y + 2xy^3 + y) dx + [x^2 y^4 e^y - x^2 y^2 - 3x] dy = 0$ . 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  $\frac{1}{3}$ <sup>rd</sup> method and (iii) Simpsons  $\frac{3}{8}$ <sup>th</sup> 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