Time: (03) hours   Total Marks: 100

N.B. (i) Question no. ONE is compulsory.
   (ii) Attempt any FOUR questions from remaining six questions.
   (iii) Figures to right indicate full marks.

Q. 1 (a) Evaluate   3

$$\int_0^{\pi/6} \cos^3 3\theta \sin^2 6\theta \, d\theta$$

(b) Solve   3

$$\frac{d^3y}{dx^3} + 2\frac{d^2y}{dx^2} - 5\frac{dy}{dx} - 6y = 0$$

(c) Evaluate   3

$$\int_{-1}^{1} \int_0^z \int_{x-z}^{x+z} (x+y+z)\, dy\, dx\, dz$$

(d) Evaluate   3

$$\int_1^2 \int_0^x \frac{1}{x^2+y^2}\, dy\, dx$$

(e) Solve $\left(2x^2+3y^2-7\right)x\,dx + \left(3x^2+2y^2-8\right)y\,dy=0$ 4

(f) Using Euler's method find the approximate value of y where   4

$\frac{dy}{dx}=x+2y,\; y(1)=1$ taking $h=0.2$ at $x=2$

Q.2 (a) Evaluate   6

$$\int_0^{\pi/2} \int_0^{1-\sin\theta} r^2 \cos\theta \, dr\, d\theta$$

(b) Evaluate $\iiint (x+y+z)\,dx\,dy\,dz$ over the tetrahedron bounded by the planes $x=0,y=0,z=0\, and\, x+y=z=1$ 6

(c) Show that   8

$$\int_0^\infty \frac{\tan^{-1}(x/a)-\tan^{-1}(x/b)}{x}dx = \frac{\pi}{2}\log\left(\frac{b}{a}\right) where\, a>0,b>a$$

Q.3 (a) Solve   6

$$\tan y\frac{dy}{dx}+\tan x = \cos y\cos^3 x$$

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(b) Find by double integration the area between the curves   6

$$y^2 = 4x \quad \text{and} \quad 2x - 3y + 4 = 0$$

© Solve   8

$$\frac{d^2 y}{dx^2} + 9y = e^x - \cos 2x$$

Q.4 (a) Solve   6

$$(4xy + 3y^2 - x)dx + x(x + 2y)dy = 0$$

(b) Change the order of integration and evaluate   6

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{e^y}{(e^y + 1)\sqrt{1 - x^2 - y^2}} dy\, dx$$

© Using Taylor's series method solve the differential equation   8

$$\frac{dy}{dx} = x + y, \text{ start from } x = 1, y = 0 \text{ and carry to } x = 1.2 \text{ with } h = 0.1$$

Q.5 (a) Find the length of one arc of the cycloid $x = a(\theta - \sin\theta), y = a(1 + \cos\theta)$ 6

(b) Find the volume bounded by the cylinder $x^2 + y^2 = a^2$ and the planes $z = 0$ and $y + z = b$ 6

© Solve numerically using Runge – Kutta Method of Fourth order the differential equation $\frac{dy}{dx} = xy$ with initial conditions $y(1) = 1$ at $x = 1.2$ 8

taking $h = 0.1$

Q.6 (a) Evaluate   6

$$\int_0^1 x^{q-1}\left(\log\frac{1}{x}\right)^{p-1} dx$$

(b) Evaluate   6

$$\iint (x^2 - y^2)x\,dx\,dy \text{ over the positive quadrant of the circle } x^2 + y^2 = a^2$$

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(c) Solve by method of variation of parameters $\left(D^2 + a^2\right) y = \sec ax$ 8

Q.7 (a) Evaluate   6

$$\int_0^1 x^6 \left(1 - x^2\right)^{1/2} dx$$

(b) Change to polar coordinates and evaluate $\int_0^a \int_y^a x\,dx\,dy$ 6

(c) The charge q on the plate of a condenser of capacity C charged through a   8
resistance R by a steady voltage V satisfies the differential equation
$R\dfrac{dq}{dt} + \dfrac{q}{C} = V$. If $q = 0$ at $t = 0$, show that $q = CV\left(1 - e^{-t/RC}\right)$. Find also
the current flowing into the plate.

5/6/17

IEE-sem-II- OLD   Q.P.Code: 16201

(3 Hours)   **Total Marks: 100**

N.B.: (1) Question No. 1 is compulsory.
       (2) Attempt any four questions out of remaining six questions.

Q1. a) What are constructors? Explain different types of constructors with example.   [10]
    b) Write a program in java to check whether the given string is palindrome or not.   [10]

Q2. a) Explain life cycle of a thread.   [10]
    b) Write short note on thread synchronization.   [10]

Q3. a) What is vector? How it is different from an array?   [10]
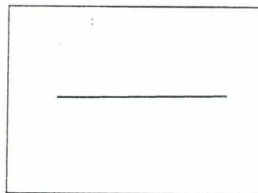   b) Explain exception handling in java with example.   [10]

Q4. a) Write a program in java to display the following pattern: [10]
         A

         A   B

         A   B   C

         A   B   C   D

    b) Write a program in java to find factorial of a given number.   [10]

Q5. a) Write an applet to display the following: [10]

         _____
        | : |
        | |
        | _____ |
        | |
        |_____|

    b) What is command line argument? Write a prgram in java to find largest of two numbers
        accepted from command line.   [10]

Q6. a) Explain how java supports multiple inheritance with example.   [10]

    b) Write a program in java to find largest of three numbers accepted from command line.   [10]

Q7. Write short note on (any two)   [20]
        a) Life cycle of a thread
        b) Call by value and Call by reference
        c) Wrapper class
        d) Access protection in java

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