FE SEM II (OLD) ANII 15/5/14

(OLD COURSE) QP Code : **MV-17726**

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

N. B. : (1) Question No. 1 is **compulsory.**
(2) Attempt any **four** questions from the remaining six questions.
(3) **Figures** to the **right** hand side indicate **full** marks.

1. (a) Solve $(2D^2 + 5D - 12)\, y = 0$ 3

(b) Evaluate $\int_0^\infty x\, e^{-x^4}\, dx$ 3

(c) Evaluate $\int_0^1 \int_{x^2}^{x} xy(x+y)\, dy\, dx$ 3

(d) Evaluate $\int_0^1 \sqrt{1-x^4}\, dx$ 3

(e) If $B(n,3) = \frac{1}{105}$ find 'n' where n is +ve integer. 4

(f) Using Euler's method find approximate value of y at x=1 in five steps taking $n = 0.2$. Given $\frac{dy}{dx} = x+y$ and $y(0) = 1$. 4

2. (a) Prove that $\int_0^3 \frac{x^{\frac{3}{2}}}{\sqrt{3-x}}\, dx \cdot \int_0^1 \frac{dx}{\sqrt{1-x^{\frac{1}{4}}}} = \frac{432}{35}\pi$ 6

(b) Solve $(D^2 - D + 1)\, Y = \cos 2x$. 6

(c) Solve the differential equation $\frac{dy}{dx} = xy$ with initial conditions $y(1) = 2$ and find y at (i) $x = 1.2$ (ii) $x = 1.4$. By Runge-Kutta method of Fourth order. 8

3. (a) In a circuit containing inductance, L, resistance R, voltage E, the current I, is given by $L\frac{dI}{dt} + RI = E$, find current I at time t if at $t = 0$, $I = 0$ and L, R, E are constant. 6

(b) Find the length of the astroid $x = a\cos^3 t$, $y = a\sin^3 t$ 6

(c) Solve $\frac{d^2y}{dx^2} - 4\frac{dy}{dx} + 4y = x^2 + e^x + \cos^2 x$ 8

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4. (a) Evaluate $\int_0^a\int_0^a\int_0^a (yz+zx+xy)dxdydz$ 6

(b) Find the volume bounded by the cone $z^2 = x^2 + y^2$ and the paraboloid; 6

$z = x^2 + y^2$

(c) Apply the method of variation of parameters to solve 8

$(D^2 - 2D + 2)\, y = e^x \tan x.$

5. (a) Solve using Toylor's series method the differential equation $\frac{dy}{dx} = x + y$ start 6

from $x = 1, y = 0$ and carry to $x = 1.2$ with $h = 0.1$

(b) Find by double integration the area of the cordiod $r = a(1 + \cos\theta)$ 6

(c) Change the order of integration and evaluate 8

$$\int_0^a \cdot \int_{\frac{x^2}{a}}^{2a-x} xy\, dy\, dx$$

6. (a) Change to polar co-ordinates and evaluate 6

$$\int_0^a\int_y^a \frac{x^2}{\sqrt{x^2 \times y^2}}\, dx\, dy$$

(b) Find the length of the cardioid $r = a(1 - \cos\theta)$ which lies out side the circle 6

$r = a\cos\theta$.

(c) Prove that $B(m,n) = \frac{\lceil m \lceil n}{\lceil m+n}$ 8

7. (a) Solve $(x^2 + y^2 + 1)\, dx - 2xydy = 0$ 6

(b) Solve $\frac{dy}{dx} = x^3y^3 - xy$ 6

(c) Solve $(D^2 + 2)\, y = e^x \cos x + x^2e^{3x}$ 8
