Paper / Subject Code: 29711 / Engineering Mathematics - II

May 15, 2024 10:30 am - 01:30 pm 1T01832 - F.E.(SEM II)(ALL BRANCHES) (Rev - 2019 C Scheme) / 29711 - Engineering Mathematics - II P CODE: 10054518

(Time: 3 hours) **Max Marks: 80**

Note: (1) Question No. 1 is Compulsory.

(2) Answer any three questions from Q.2 to Q.6.

(3) Figures to the right indicate full marks.

Q1.

a) Solve: $\frac{dy}{dx} = \frac{tany - 2xy - y}{x^2 - xtan^2y + sec^2y}$ **5**

b) Solve: $[(D-2)^2(D+1)]y = e^{2x} + \sin 3x$ **5**

c) Using Euler's method find $y(0.5)$ for $\frac{dy}{dx} = 1 + xy\,; y(0) = 1$ with $h = 0.1$, correct up to 3 decimal places. **5**

d) Change the order of Integration for $I = \int_0^5 \int_{2-x}^{2+x} f(x,y)dy\, dx$ **5**

Q2.

a) Solve: $(D^3 - 4D + 4)y = x^2 + \cos 2x$ **6**

b) Solve: $x\frac{dy}{dx} + (1+x)y = e^x$ **6**

c) Evaluate $\text{I} = \int_0^3 \frac{dx}{1+x}$ using **8**

1) Simpson's 3/8th rule 2)Simpson's 1/3rd rule 3)Trapezoidal rule.

Q3.

a) Using DUIS rule show that $\int_0^\infty \frac{tan^{-1}(ax)}{x(1+x^2)}\, dx = \frac{\pi}{2}\, log(1+a)$ **6**

b) Evaluate $\iint y\, dx\, dy$ over a region bounded by $y = x^2$ and $x + y = 2$ **6**

c) Evaluate: $\text{I} = \int_0^2 \int_0^x \int_0^{2x+2y} e^{x+y+z}\ dz\, dy\, dx$ **8**

Q4.

a) Find using double integration the area inside the circle $r = a\sin\theta$ and outside the cardioid $r = a(1 - \cos\theta)$ **6**

b) Using Runge-Kutta Method of order four find $y(0.1)$ for $\frac{dy}{dx} = \sqrt{x + y}$; $y(0) = 1$ with $h = 0.1$, correct up to 3 decimal places. **6**

c) Show that: $\int_0^\infty x^2 e^{-x^4}\, dx \; * \int_0^\infty \frac{e^{-x^2}}{\sqrt{x}}\, dx = \frac{\pi}{4\sqrt{2}}$ **8**

Q5.

a) Evaluate $I = \iiint (x^2y^2 + y^2z^2 + z^2x^2)\; dx\, dy\, dz$ throughout the volume of the sphere $x^2 + y^2 + z^2 = a^2$ **6**

b) Solve: $(x\sec^2 y - x^2 \cos y)dy = (\tan y - 3x^4)dx$ **6**

c) Solve by method of variation of parameter $(D^2 + 9)y = \frac{1}{1+\sin 3x}$ **8**

Q6.

a) Using modified Euler's method find $y(0.2)$ for $\frac{dy}{dx} = x - y^2$; $y(0) = 1$ with $h = 0.2$, correct up to 3 decimal places. **6**

b) Find the length of the cardioid $r = a(1 + \cos\theta)$ which lies outside the circle $r + a\cos\theta = 0$ **6**

c) Change into polar coordinates and evaluate **8**

$$\int_0^{a/\sqrt{2}} \int_y^{\sqrt{a^2-y^2}} \log(x^2 + y^2)\, dx\, dy$$

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