KGCE/ Sem-II / CBGS/ App. Maths. II / 22.11.16

Q.P. Code : 529901

3 Hours **Total Marks : 80**

(1) N.B.:- Question no 1 is compulsory.
(2) Attempt any THREE questions out of remaining FIVE questions.

1)a) Solve $\left[\log(x^2+y^2)+\dfrac{2x^2}{x^2+y^2}\right]dx+\left(\dfrac{2xy}{x^2+y^2}\right)dy=0$ (4)

b) *Solve* $(D^4+2D^2+1)y=0$ (3)

c) Evaluate $\int_0^{\infty} e^{-x^5}\,dx$ (3)

d) Express the following integral in polar co-ordinates: $\int_0^{\frac{a}{\sqrt{2}}}\int_y^{\sqrt{a^2-y^2}} f(x,y)\,dx\,dy$ **(4)**

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

f) Evaluate $I=\int_0^{\pi/2}\int_{\pi/2}^{\pi}\cos(x+y)\,dx\,dy$ **(3)**

2 a) Solve $\dfrac{dy}{dx}+\dfrac{y}{x}\log y=\dfrac{y}{x^2}(\log x)^2$. (6)

b) Change the order of integration and evaluate $I=\int_0^2\int_{\sqrt{2y}}^2\dfrac{x^2\,dx\,dy}{\sqrt{(x^4-4y^2)}}$. (6)

c) Evaluate $\int_0^{\pi/2}\dfrac{dx}{1+a\sin^2 x}$ and deduce that $\int_0^{\pi/2}\dfrac{\sin^2 x\,dx}{(3+a\sin^2 x)^2}=\dfrac{\pi\sqrt{3}}{96}$ **(8)**

3 a) Evaluate $I=\int_0^a\int_0^x\int_0^{x+y}e^{x+y+z}\,dx\,dy\,dz$ (6)

b) If mass per unit area varies as the square of the ordinate of a point, find the mass of a lamina bounded by the cycloid $y=a(1-\cos\theta)$, $x=a(\theta+\sin\theta)$ and the ordinates from the two cusps and the tangents at the vertex (6)

c) Solve $(2x+1)^2\dfrac{d^2y}{dx^2}-6(2x+1)\dfrac{dy}{dx}+16y=8(2x+1)^2$ **(8)**

4 a) *Show that the length of the arc of the parabola* $y^2=4ax$ *cut off by the line* $3y=8x$ *is* $a\left[\log 2+\dfrac{15}{16}\right]$. (6)

b) *Solve* $\dfrac{d^3y}{dx^3}-7\dfrac{dy}{dx}-6y=\cos x\cosh x$ (6)

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c) Using fourth order Runge-Kutta method, find u(0.4) of the initial value problem $u' = -2tu^2$, u(0)=1 take $h = 0.2$. **(8)**

5 a) Use method of variation of parameters to solve $\frac{d^2y}{dx^2} - 5\frac{dy}{dx} + 6y = e^{2x}x^2$. (6)

b) Using Taylor's series method, obtain the solution of $\frac{dy}{dx} = 3x + y^2, y(0) = 1$ (6)

Find the value of y for x = 0.1 correct to four decimal places

c) Find the value of the integral $\int_0^1 \frac{x^2}{1+x^3} dx$ by taking h= 0.2 , using **(8)**

(i) Trapezoidal Rule (ii) Simpson's 1/3 Rule.

Compare the errors with the exact value of the integral

6 a) A condenser of capacitance C is charged through a resistance R by a steady voltage. The charge Q satisfies the DE $R\frac{dQ}{dt} + \frac{Q}{c} = V$. If the plate is chargeless find the charge and the current at time 't' (6)

b) Evaluate $\iint \frac{(x^2+y^2)^2}{x^2y^2} dxdy$ over the region common to $x^2 + y^2 - ax = 0$ and $x^2 + y^2 - by = 0,\ a > 0,\ b > 0$? (6)

c) Find the volume common to the right circular cylinder $x^2 + y^2 = a^2$ and $x^2 + z^2 = a^2$ **(8)**
