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MAF-769 Seat No._____

B. Sc. (Sem. V) Examination

October / November – 2018

Mathematics : Paper-CC-MATH : 503

(Differential Equations)

Time : **3** Hours] [Total Marks : **70**

Instruction :

(1) All questions are compulsory.

(2) Figures to the right indicate the marks of corresponding question.

1 (a) Prove that **6**

$$\frac{1}{f(D)}[e^{ax}.v] = e^{ax}.\frac{1}{f(D+a)}.V$$

Where a = constant, V = Function of x.

(b) Solve : $(D^2+2)y = x^2.e^{3x}$. **6**

(c) Solve : $(D^2+4)y = x.\sin 2x$. **6**

OR

1 (a) If $f(D) = (D-a)^r \phi(D), \phi(a) \neq 0$ then prove **6**

that $\frac{1}{f(D)}e^{ax} = \frac{1}{\phi(a)}.\frac{x^r}{r!}e^{ax}$

$$= \frac{x^r.e^{ax}}{f^{(r)}_{(a)}}$$

(b) Solve : $(D^2 - 5D + 6)y = \sin 3x$. 6

(c) Solve : $(D^2 - 1)y = x^2.\cos x$. 6

2 (a) Find the Fiarl. Integral of 6

$$y^{(3)} + \cos x.y^{(2)} - 2\sin x.y^{(1)} - y\cos x = \sin 2x$$

(b) Solve : $y^{(2)} = \sec^2 y.\tan y$, given that 6

$$y = 0, y^{(1)} = 1 \text{ when } x = 0$$

(c) Solve : $y.(1 - \log y)y^{(2)} + (1 + \log y)\{y^{(1)}\}^2 = 0$. 6

OR

2 (a) Obtain the Fiarl. Integral of 6

$$x^2.y_3 + x.y_2 + (2xy - 1)y_1 + y^2 + 2x = 0$$

(b) Solve : $y^{(2)} = y^3 - y$ given that $y^{(1)} = 0$ 6

for $y = 1$.

(c) Solve : $y^{(4)} + a^2.y^{(2)} = 0$. 6

3 (a) Solve : $xy^{(2)} - (2x - 1)y^{(1)} + (x - 1)y = 0$. 6

(b) Solve : $y^{(2)} - 2\tan x.y^{(1)} + 5y = e^x.\sec x$ 6

[Using normal form]

(c) Solve : $y^{(2)} - 2y^{(1)} + y = xe^x.\log x$ 6

[Using variation of Parameter method]

OR

3 (a) Solve : $y^{(2)} - \cot x.y^{(1)} - (1 - \cot x)y = e^x \sin x$. **6**

(b) Solve : $y^{(2)} + (3\sin x - \cot x)y^{(1)} + 2y\sin^2 x$ **6**

$= e^{-\cos x}.\sin^2 x$

[By changing the independent variable]

(c) Solve : $y^{(2)} + y = 2e^x + \cos x$ **6**

[By method of undermined coefficients]

4 Solve any **four** : **16**

(1) $(D^4 - 4D^3 + 8D^2 - 8D + 4)y = 0$

(2) $(D^4 + 4D + 4)y = 2\sinh(2x)$

(3) $y^{(2)} = x^2.\sin x$

(4) $ay^{(3)} = y^{(2)}$

(5) $xy^{(2)} + (x-2)y^{(1)} - 2y = x^3$

[By Factorisation of the operator method]

(6) $y^{(2)} + 2y^{(1)} + y = x - e^x$

[By method of undetermined coefficients]
