Reg. No..................................

FIFTH SEMESTER B.Sc. DEGREE (U.G.—CCSS) EXAMINATION NOVEMBER 2014

(SDE)

Mathematics

MM 5B 08—DIFFERENTIAL EQUATIONS

Time : Two Hours and Forty-Five Minutes — Maximum : 27 Weightage

Part B

Section A

Answer all *questions.*
Each question carries weightage 1.

1. Find the order and degree of $y = x\dfrac{dy}{dx} + \dfrac{x}{dy/dx}$

2. Is $x = a \sin (nt + \alpha)$ a solution of $\dfrac{d^2x}{dt^2} + n^2 x = 0$? Why ?

3. Is $ydx - xdy + (x^2 + y^2)\, dx = 0$ exact

4. State the existence and uniqueness theorem for solutions of a first order differential equation.

5. Solve $(e^x + 1)y\, dy = e^x (y + 1)\, dx$.

6. Solve $\dfrac{d^2y}{dx^2} + a^2 y = 0$.

7. Give the standard form of a homogenous differential equation of second order.

8. Solve $\dfrac{d^2y}{dx^2} + 6\dfrac{dy}{dx} + 9y = 0$.

9. **Find the complex conjugate and modulus of** $z = -1 - \sqrt{3}\, i$.

(9 x 1 = 9 weightage)

Section B

Answer any **five** *questions.*
Each question carries weightage **2.**

10. **Test for exactness and solve if possible :**

$$(1 + xy)\, ydx + (1 - xy)\, xdy = 0.$$

Turn over

11. Find the differential equation of the family of circles with their centres at the origin.

12. Define Wronskian of two functions and use it to check whether $y = xe^x$ and $y_2 = xe^{\ x}$ are linearly independent.

13. Solve $\frac{d^2y}{dx} \ 12 \frac{d\text{ʌı}}{dx} + 36\,y - e^{\hat{}}$

14. Solve $\frac{d\,\hat{}\,y}{dx^2} + 2\frac{dy}{dx} + y = 2x + x^2.$

15. Express in modulus amplitude form :

$$\frac{1}{(2+i)^2} \quad \frac{1}{(2-}$$

16. If z_1 and z_2 are any *two* complex numbers, find the modulus and amplitude of z_1, z_2 and $\frac{z_{\cdot}}{2}$ and represent them geometrically.

(5 x 2 = 10 weightage)

Section C

III. Answer any *two* questions. Each question carries weightage 4.

17 Find the solution by the method of variation of parameters :

$$\frac{d^2\text{ʌı}}{dx^2} \quad \frac{d\text{ʌı}}{dx} - 6y = e^{-}x$$

18 Solve the following :

(a) $\frac{d^2\text{ʌı}}{dx} + 5\frac{d\text{ʌı}}{dx} - 6y = \sin 4x \sin x.$

(b) $\frac{d\,\hat{}\,y}{dx^2} + 4y = \cos 2x.$

19 (a) If $a + \ = \frac{1}{a+ib}$, prove that $(a^2 \quad \beta^2)(a^2 = b^2 \ -1$

(b) Show that the sum of two complex numbers is again a complex number.

(c) If z is a complex **number and z its conjugate, find the real and imaginary any** parts of z in terms of z and

(d) Determine the region in the z plane represented by

(i) $1 < |z + 2i|$ 5 3. (ii) $\pi/6 \leq \text{amp.}\, z \leq \pi/3.$

(2 x 4 = 8 weightage)