DR. BABASAHEB AMBEDKAR TECHNOLOGICAL UNIVERSITY, LONERE

End – Semester Examination (Supplementary): November 2018

Branch: B. Tech (Common to all) **Semester:** II

Subject with code: Engineering Mathematics – II (MATH 201)

Date: 27/11/2018 **Max Marks:** 60 **Duration:** 03 Hrs.

INSTRUCTION: Attempt any **FIVE** of the following questions. All questions carry equal marks.

Q.1 (a) Prove that $\cos^6\theta - \sin^6\theta = \frac{1}{16}(\cos 6\theta + 15\cos 2\theta)$. [6 *Marks*]

(b) If $an(A + iB) = x + iy$, prove that

(i) $\tan 2A = \frac{2x}{1-x^2-y^2}$ (ii) $\tanh 2B = \frac{2y}{1+x^2+y^2}$ [6 *Marks*]

Q.2 (a) Solve $\left(1 + e^{\frac{x}{y}}\right)dx + e^{\frac{x}{y}}\left(1 - \frac{x}{y}\right)dy = 0$. [6 *Marks*]

(b) Solve

$$x - xdy + \log x dx = 0.$$ [6 *Marks*]

Q.3 **Solve any TWO:**

(a) Solve $y'' + 4y' + 13y = 18e^{-2x}$ [6 *Marks*]

(b) Solve $(D^2 + 5D + 4)y = x^2 + 7x + 9$ [6 *Marks*]

(c) Solve by the method of variation of parameters

$$\frac{d^2y}{dx^2} + y = \operatorname{cosec} x .$$ [6 *Marks*]

Q.4 (a) Find the Fourier series of $f(x) = x^2$ in the interval $(0,\ 2\pi)$ and hence deduce that

$$\frac{\pi^2}{12} = \frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \cdots$$ [6 *Marks*]

(b) Expand the function $f(x) = \pi x - x^2$ in a half – range sine series in the interval $(0,\ \pi)$.

[6 *Marks*]

P.T.O.

E66B3217D5B275AB0CBD2E0B0299E7F6

Q.5 (a) The necessary and sufficient condition for vector $\vec{F}(t)$ to have constant magnitude is

$$\vec{F}(t)\cdot\frac{d\vec{F}(t)}{dt} = 0.$$ [6 Marks]

(b) A point moves in a plane so that its tangential and normal components of acceleration are equal and the angular velocity of the tangent is constant and equal to ω. Show that the path is equiangular spiral $\omega s = Ae^{\omega t} + B$, where A & B are constants. [6 Marks]

Q.6 **Solve any TWO:**

(a) Find curl $\vec{F}$, where $\vec{F} = \nabla\left(x^3 + y^3 + z^3 - 3xyz\right)$. [6 Marks]

(b) If $\vec{r}$ is a position vector with $r = |\vec{r}|$, show that

$$\nabla\cdot(r^n\vec{r}) = (n+3)r^n$$ [6 Marks]

(c) Show that $\iiint_v \frac{dv}{r^2} = \iint_s \frac{\vec{r}\cdot\hat{n}}{r^2}\,ds$ [6 Marks]

****