

**B.TECH. SEM -II (CHEMICAL/ CIVIL/ ELECTRICAL/
MECHANICAL/ PRODUCTION/ COMPUTER/ INFO. TECH./
ELECTRONICS / BIO MEDICAL / E & TC) 2014 COURSE (CBCS)
: SUMMER - 2018**

SUBJECT: ENGINEERING MATHEMATICS – II

Day: **Friday**
Date: **01/06/2018**

S-2018-2213

Time: **10.00 AM TO 01.00 PM**
Max. Marks: **60**

N.B.:

- 1) All questions are **COMPULSORY**.
- 2) Figures to the right indicate **FULL** marks.
- 3) Draw neat and labelled diagrams **WHEREVER** necessary.
- 4) Use of non-programmable **CALCULATOR** is allowed.

Q.1 a) Solve: $(x^4 + y^4)dx - 2x^3y dy = 0$ **(05)**

b) Solve: $x^2 \frac{dy}{dx} = e^y - x$. **(05)**

OR

Q.1 a) Solve: $\frac{dy}{dx} - y \tan x = y^4 \sec x$ **(05)**

b) Solve: $\left(xy^2 - e^{\frac{1}{x^3}}\right)dx - x^2y dy = 0$. **(05)**

Q.2 a) A particle is moving in a straight line with acceleration $k(x + \frac{a^4}{x^3})$ directed towards origin. If it starts from rest at a distance 'a' from the origin, prove that it will arrive at the origin at the end of time $\frac{\pi}{4\sqrt{k}}$. **(05)**

b) A body of temperature $100^\circ C$ is placed in a room, whose temperature is $25^\circ C$ and cools to $50^\circ C$ in 5 minutes. What will be its temperature after a further interval of 5 minutes? **(05)**

OR

Q.2 a) A steam pipe 20 cm in diameter is protected with a covering 6 cm thick for which the coefficient of thermal conductivity is $k=0.0003 \text{ cal/cm deg. sec}$. steady state. Find the heat loss per hour through a meter length of the pipe, if the surface of the pipe is at $200^\circ C$ and the outer surface of the covering is at $30^\circ C$. **(05)**

b) In a circuit containing inductance L, resistance R and voltage E, the current I is given by $E = RI + L \frac{dI}{dt}$, where $I(0)=0$. If $L=640 \text{ h}$, $R=250 \Omega$ and $E=500$ units, find the time that elapses ,before the current reaches 90% of its maximum value. **(05)**

Q.3 Obtain Fourier series for the function $f(x)$, defined as **(10)**
$$f(x) = \begin{cases} x, & 0 \leq x \leq \pi, \\ 2\pi - x, & \pi \leq x \leq 2\pi \end{cases}$$

OR

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Q.3 a) Obtain reduction formula for $I_n = \int_0^{\frac{\pi}{2}} \theta \sin^n \theta d\theta$ and hence find I_5 . (05)

b) Evaluate: $\int_3^7 (x-3)^{\frac{1}{4}} (7-x)^{\frac{1}{4}} dx$. (05)

Q.4 a) Trace the curve: $y^2(x^2 + y^2) + a^2(x^2 - y^2) = 0$ (05)

b) Evaluate using the rule of differentiation under integral sign, the integral (05)

$$\int_0^{\infty} \frac{e^{-\beta x} \sin \alpha x}{x} dx$$

OR

Q.4 a) Trace the curve : $y^2 = \frac{a^3 x}{a^2 - x^2}$ (05)

b) If $\alpha(x) = \sqrt{\frac{2}{\pi}} \int_0^x e^{-\frac{t^2}{2}} dt$, show that $\operatorname{erf}(x) = \alpha(x\sqrt{2})$ (05)

Q.5 a) Find the equation of sphere through the circle $x^2 + y^2 = 4, z = 0$ meeting the plane $x + 2y + 2z = 0$ in a circle of radius 3. (05)

b) Find the equation of the right circular cylinder of radius 2, whose axis is the line $\frac{x-1}{2} = \frac{y-2}{1} = \frac{z-3}{2}$. (05)

OR

Q.5 a) Find the equation of sphere which passes through the point (3,1,2) and meets xoy plane in a circle of radius 3 units with the centre at (1,-2,0). (05)

b) Find the equation of the cone whose vertex is (1,2,3) and guiding curve is the circle $x^2 + y^2 + z^2 = 4, x + y + z = 1$. (05)

Q.6 a) Evaluate by using change of order of integration: (05)

$$\int_0^a \int_0^y \frac{dx dy}{\sqrt{(a^2 + x^2)(a-y)(y-x)}}$$

b) Find the volume of the cylinder $x^2 + y^2 = 2ax$, intercepted between the paraboloid $x^2 + y^2 = 2az$ and the xy - plane. (05)

OR

Q.6 a) Find by double integration the area inside the circle $r = a \sin \theta$ and outside the cardioid $r = a(1 - \cos \theta)$. (05)

b) Evaluate: $\iiint \frac{dx dy dz}{\sqrt{1-x^2-y^2-z^2}}$ taken throughout the volume of the sphere $x^2 + y^2 + z^2 = 1$ in the positive octant. (05)

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