B. Tech - sem - II, (2014 course), computer - winter-2018

B.Tech. SEM -II (Chemical/ Civil/ Electrical/ Mechanical/ Production/ Computer/ Info. Tech./ Electronics / Bio Medical / E & TC) 2014
Course (CBCS) : WINTER - 2018
SUBJECT: ENGINEERING MATHEMATICS - II

Day: Tuesday
Date: 13/11/2018

W-2018-2269

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) Assume suitable data, if necessary.

Q.1 **a)** Solve: $x\frac{dy}{dx}+\frac{y^2}{x}=y$ **(05)**

b) Solve: $\left(xy^2+2x^2y^3\right)dx+\left(x^2y-x^3y^2\right)dy=0$ **(05)**

OR

Q.1 **a)** Solve: $\left(\frac{e^{-2\sqrt{x}}}{\sqrt{x}}-\frac{y}{\sqrt{x}}\right)\frac{dx}{dy}=1$ **(05)**

b) Solve: $\frac{dy}{dx}+x\tan(y-x)=1$ **(05)**

Q.2 **a)** A body at temperature 100^0C is placed in a room whose temperature is 20^0 C and cools to 60^0C in 5 minutes. Find its temperature after a further interval of 3 minutes. **(05)**

b) A steam pipe 20cm in diameter is protected with a covering 6cm thick for which the coefficient of thermal conductivity is k = 0.0003 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 200^0C and outer surface of the covering is at 30^0C. **(05)**

OR

Q.2 **a)** The equation of electromotive force in terms of current i for an electrical circuit having resistance R and a condenser of capacity C, in series, is $E=Ri+\int\frac{i}{c}dt$. Find the current i at any time t, when $E=E_0\sin wt$. **(05)**

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

Q.3 If $f(x)=\begin{cases}\pi x, & 0\le x\le 1\\ \pi(2-x), & 1\le x\le 2\end{cases}$ period 2,

Show that in the interval $0\le x\le 2$, $f(x)=\frac{\pi}{2}-\frac{4}{\pi}\sum_{n=0}^{\infty}\frac{1}{(2n+1)^2}\cos(2n+1)\pi x$ **(10)**

OR

P.T.O.

Q.3 **a)** Evaluate: $\int_0^{\pi} x \sin^7 x \cos^4 x \, dx$ **(05)**

b) Prove that: $\int_0^1 \frac{dx}{\sqrt{x \log \frac{1}{x}}} = \sqrt{2\pi}$ **(05)**

Q.4 **a)** Trace the curve: $y^2(a^2 - x^2) = a^3 x$ **(05)**

b) Prove that: $\int_0^1 \frac{x^a - 1}{\log x} dx = \log(1+a);\ a \geq 0$ **(05)**

OR

Q.4 **a)** Prove that: $erf_c(-x) + erf_c(x) = 2$ **(05)**

b) Trace the curve: $r^2 = a^2 \cos 2\theta$ **(05)**

Q.5 **a)** Find the equation of the sphere passing through: **(05)**
$(1, 0, -1)$, $(2, 1, 0)$, $(1, 1, -1)$ *and* $(1, 1, 1)$

b) Obtain the equation of guiding curve given by $x^2 - 2y^2 + z^2 = 4$, $x - y + z = 3$ **(05)**

OR

Q.5 **a)** A sphere of constant radius r passes through the origin and meets the co-ordinate axes in A, B, C. Show that the locus of centered of the triangle ABC is sphere of $9(x^2 + y^2 + z^2) = 4r^2$. **(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)**

Q.6 Show that: $\int_0^1 \int_{x}^{\frac{1}{x}} \frac{y \, dx \, dy}{(1+xy)^2 (1+y^2)} = \frac{\pi - 1}{4}$ **(10)**

OR

Q.6 Evaluate $\iiint \frac{dx \, dy \, dz}{\sqrt{1 - x^2 - y^2 - z^2}}$ taken throughout the volume of the sphere **(10)**
$x^2 + y^2 + z^2 = 1$ in the positive octant.

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