

B.Tech. SEM -II (2007 Course) (All Branches) : WINTER - 2018
SUBJECT: ENGINEERING MATHEMATICS - II

Day: Tuesday
Date: 13/11/2018

W-2018-2690

Time: 10.00 AM TO 01.00 PM
Max Marks. 80

N.B. :

- 1) **Q. No. 1 and Q. No. 5 are COMPULSORY.** Out of remaining attempt **ANY TWO** question from each section.
- 2) Figures to the right indicate **FULL** marks.
- 3) Answers to both the sections should be written in **SEPARATE** answer books.
- 4) Use non-programmable **CALCULATOR** is allowed.
- 5) Assume suitable data, if necessary.

SECTION – I

- Q.1**
- a) Find the spherical polar co-ordinates of the point $(1, -1, -1)$ **(04)**
 - b) Form the differential equation whose general solution is $y = C_1 e^{2x} + C_2 e^{-3x}$ **(04)**
 - c) A body of mass 'm' falls from rest under the influence of gravity and a retarding force due to air resistance proportional to square of the velocity. Find the velocity and distance described as a function of time. **(06)**
- Q.2** Solve **Any Three** of the following : **(13)**
- a) $(x^4 + y^4) dx - 2x^3 y dy = 0$
 - b) $\frac{dy}{dx} = \frac{3x + 2y + 2}{2x + 3y - 1}$
 - c) $(2x + e^x \log y) y dx + e^x dy = 0$
 - d) $\frac{dy}{dx} + x \sin 2y = x^3 \cos^2 y$
- Q.3**
- a) Water at temperature 80°C cools in 5 minutes to 60°C in a room of temperature 20°C . Find the temperature of water after 15 minutes. **(04)**
 - b) A pipe 12 cm in diameter contains steam at 100°C . It is covered with asbestos, 5 cm thick, for which $k = 0.0006$ and the outside surface is at 30°C . Find the amount of heat lost per hour from a meter long pipe. **(04)**
 - c) A resistance of 50Ω , an inductance of 0.4 henry are connected in series with a battery of 30 volts. Find the current in a circuit as a function of t. **(05)**
- Q.4**
- a) Find the equation of the cone whose vertex is at the point $(1, 1, 2)$ and which passes through the ellipse $x^2 + z^2 = 1, y = 4$. **(04)**
 - b) Find the equation of the sphere through the four points $(0, 0, 0)$, $(-1, 2, 3)$, $(1, -2, 3)$ and $(1, 2, -3)$. **(04)**
 - c) Find the equation of right circular cylinder of radius 3 whose axis passes through $(1, 2, 3)$ and has direction cosines proportional to $2, -1, 2$. **(05)**

P.T.O.

SECTION - II

Q.5 (05)

a) Solve $\int_0^a \int_0^x \frac{\tan^{-1}\left(\frac{y}{a}\right) dx dy}{(a^2 + y^2)\sqrt{(a-x)(x-y)}}$

b) Trace the curve $r = a \sin 3\theta$ (04)

c) If $f(x) = \begin{cases} x & 0 \leq x \leq \pi \\ 2\pi - x & \pi \leq x \leq 2\pi \end{cases}$ and $f(x+2\pi) = f(x)$ (05)

Express $f(x)$ as a Fourier series

Q.6 a) If $U_n = \int_0^{\pi/4} \sin^{2n} x dx$, prove $U_n = \left(1 - \frac{1}{2n}\right) U_{n-1} - \frac{1}{n2^{n+1}}$ (04)

Hence evaluate $\int_0^{\pi/4} \sin^6 x dx$

b) Evaluate $\int_0^{\infty} x^8 e^{-2x^2} dx$ (04)

c) If $f(x) = x^3$ ($0 < x < \pi$), find half range sine series. (05)

Q.7 a) If $y = \int_0^x g(t) \sin b(x-t) dt$, show that $\frac{d^2 y}{dx^2} + b^2 y = bg(x)$ (04)

b) Prove $\operatorname{erfc}(y) + \operatorname{erfc}(-y) = 2$ (04)

c) Trace the curve $3a y^2 = x(x-a)^2$ (05)

Q.8 a) Find the volume of region bounded by paraboloid $x^2 + y^2 = 2z$ and the cylinder $x^2 + y^2 = 4$. (04)

b) Evaluate $\iiint z^3 dx dy dz$ over the volume bounded by surfaces $x^2 + y^2 = b^2$, $x^2 + y^2 = z$ and $z=0$. (04)

c) Find the area bounded by $y = \sqrt{4ax}$ and $x = \sqrt{4ay}$. (05)

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