Diploma in Civil Engineering / Diploma in Electrical and Mechanical Engineering

03670

Term-End Examination

December, 2010

BET-021 : MATHEMATICS-II

Time : 2 hours *Maximum Marks : 70*

Note : *Question No. **1** is **compulsory**. Attempt **any four** questions out of the remaining questions no. 2 to 7. Use of calculator is permitted.*

1. (a) Select the correct answer from the given alternative for each part given below : **7x1=7**

(i) If $y = \frac{e^x}{x}$, then $\frac{dy}{dx}$ is equal to :

(A) $\frac{e^x(x-1)}{x^2}$

(B) $\frac{e^x(x+1)}{x^2}$

(C) $\frac{e^x(1-x)}{x^2}$

(D) None of these

(ii) A particle is moving with a velocity $v = \frac{1}{4}\left(t^2+5\right)^2$, its acceleration at any instant t is :

(A) $t(t^2 + 5)$

(B) $-t(t^2 + 5)$

(C) $t(t^2 - 5)$

(D) $t(t + 5)$

(iii) $\int \sqrt[4]{x^3}\,dx$ is equal to :

(A) $-\frac{4}{7}x^{\frac{7}{4}} + c$

(B) $\frac{4}{7}x^{\frac{-7}{4}} + c$

(C) $\frac{4}{7}x^{\frac{7}{4}} + c$

(D) None of these

(iv) $\int_0^1 \frac{e^{\sqrt{x}}}{\sqrt{x}}\,dx$ is equal to :

(A) $e - 1$ (B) $2(e - 1)$

(C) $2(1 - e)$ (D) $1 - e$

(v) $i^3 + i^{-3}$ is equal to :

(A) 1 (B) -1

(C) 2 (D) 0

(vi) If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, then $A^2 - 3I$ is equal to:

(A) $\begin{bmatrix} 4 & 2 \\ 2 & 4 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & 4 \\ 4 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} -4 & 2 \\ 2 & -4 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 4 \\ -4 & 2 \end{bmatrix}$

(vii) if $\Delta = \begin{vmatrix} \log_a b & 1 \\ 1 & \log_b a \end{vmatrix}$, value of Δ is :

(A) 1 (B) 2
(C) -1 (D) 0

(b) Fill in the blanks : **7x1=7**

(i) If $y = 5^x$, then $\frac{dy}{dx}$ = _____

(ii) $\lim_{x \to 0} e^x$ is equal to _____

(iii) The function,
$f : x \to x^3$ and
$g : x \to 8x+1$,
for all $x \in R$,
then function $(fog)(x)$ is equal to _____ .

(iv) Simplify $\frac{1+2i}{1-3i}$

(v) A square matrix is singular if _____ .

(vi) The median of 2, 4, 8, 9, 10, 12, 14 is _____ .

(vii) Mean deviation,

$$(MD) = \frac{1}{n} \sum f_i |x_i - \cdots|$$

2. (a) Examine the continuity of $f(x)$ at $x=-1$ 4

$$f(x)=\begin{cases}\dfrac{x^2-1}{x+1}, & x\neq -1\\ -2, & x=-1\end{cases}$$

(b) Differentiate the function $\dfrac{e^x+1}{e^x-1}$, with respect to x. 4

(c) A particle is moving in a straight line according to the equation ; $s=t^3-9t^2+3t+6$, where s is measured in metres and t in seconds. Find the acceleration when the velocity is $24\,m/s$. 6

3. (a) Evaluate : 2x7=14

$$\int\frac{3x+5}{(x+1)(x-1)^2}dx\,.$$

(b) Evaluate :

$$\int tan^{-1}x.x^2dx\,.$$

4. (a) Evaluate : 2x7=14

$$\int_{\pi/4}^{\pi/2}\cos\theta.\operatorname{cosec}^2\theta\,d\theta\,.$$

(b) Find the value of $(1+i)^{1/5}$

5. (a) Prove that, **2x7=14**

$$\left(\frac{1+\sqrt{-3}}{2}\right)^{17}+\left(\frac{-1-\sqrt{-3}}{2}\right)^{17}=-1$$

(b) Find X and Y if.

$$X+Y=\begin{bmatrix}7 & 0\\ 2 & 5\end{bmatrix},\ X-Y=\begin{bmatrix}3 & 0\\ 0 & 3\end{bmatrix}$$

6. (a) If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, then verify that **2x7=14**

$A^T A = I$, where I is a unit matrix of order 2x2.

(b) Show that (Without expanding)

$$\begin{vmatrix}a & b & c\\ a^2 & b^2 & c^2\\ a^3 & b^3 & c^3\end{vmatrix}=abc(a-b)(b-c)(c-a)$$

7. (a) Find the median for the following distribution : **2x7=14**

Wages in Rs.	No. of Workers
0 - 10	22
10 - 20	38
20 - 30	46
30 - 40	35
40 - 50	20

(b) Find the mean, mode, standard deviation for the following :

Years	No. of Persons
0 - 10	15
10 - 20	17
20 - 30	19
30 - 40	27
40 - 50	19
50 - 60	12