KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 1st Year 1st Term Examination, 2019

Math 1105

(Mathematics I)

Time: 3 Hours | Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.
iii) Assume reasonable data if any missing.

SECTION-A

1(a) A function $f(x)$ is defined as follows: 14

$$f(x) = x \qquad for\ 0 < x < 1$$
$$= 2 - x \qquad for\ 1 \leq x \leq 2$$
$$= x - \frac{1}{2}x^2 \qquad for\ x > 2$$

Discuss the continuity and differentiability of $f(x)$ at $x = 1$.

1(b) Define explicit function and implicit function with example. 10

Find $\frac{dy}{dx}$, when $\tan y = \frac{2t}{1-t^2}$, $\sin x = \frac{2t}{1+t^2}$.

1(c) State Leibnitz's theorem. If $y = (sin^{-1}x)^2$ then find y_{n+2} by using Leibnitz's theorem. 11

2(a) State Mean Value theorem. Verify it for the function $f(x) = x^3 - x^2 - 4x + 4$ in the interval $[-2,1]$. 11

2(b) If $u = \log(x^2 + y^2 + z^2)$, then find the value of $x\frac{\partial^2 u}{\partial y \partial z} + y\frac{\partial^2 u}{\partial z \partial x} + z\frac{\partial^2 u}{\partial x \partial y}$. 12

2(c) If $u = f(x^2 + 2yz, y^2 + 2zx)$, then find the value of 12

$$(y^2 - zx)\frac{\partial u}{\partial x} + (x^2 - yz)\frac{\partial u}{\partial y} + (z^2 - xy)\frac{\partial u}{\partial z}.$$

3(a) Write the intermediate forms. Evaluate: 12

$$\lim_{x \to 0}\left(\frac{xe^x - \log(1+x)}{x^2}\right).$$

3(b) Find the condition that the curves $ax^2 + by^2 = 1$ and $a_1x^2 + b_1y^2 = 1$ shall cut orthogonally. 11

3(c) Define subtangent and subnormal. Show that at any point of the curve $y^2 = 4ax$, the subnormal is constant and subtangent varies as the abscissa of the point of contact. 12

4(a) Find the maxima and minima of $\frac{4}{x} + \frac{36}{y}$ when $x + y = 4$. 11

4(b) Find all the asymptotes of the curve 12

$$x^3 - 4xy^2 - 3x^2 + 12xy - 12y^2 + 8x + 2y + 4 = 0.$$

4(c) Find the equation of the circle of curvature at the point (3,1) on the curve $y = x^2 - 6x + 10$. 12

SECTION-B

5 Integrate any three of the followings: 35

(i) $\int \frac{\sin 4x}{\sin^4 x + \cos^4 x} dx$ (ii) $\int \frac{e^x(x-1)}{(x+1)^3} dx$

(iii) $\int \frac{dx}{x^4+1}$ (iv) $\int \frac{dx}{(x-3)\sqrt{x-2}}$.

6 Answer any three of the followings: 35

(i) $\int_0^{\frac{\pi}{2}} \log \cos x \, dx$ (ii) $\int_0^{\pi} \frac{x \sin x}{1+\sin x} dx$

(iii) $\int_0^1 \frac{\log x}{\sqrt{1-x^2}} dx$ (iv) $\int_0^{\frac{\pi}{2}} \frac{dx}{1+\sqrt{\cot x}}$.

7(a) Obtain the reduction formula for $\int \sin^m x \cos nx \, dx$. 12

7(b) Evaluate: 10

$$\lim_{n\to\infty} \left[\left(1+\frac{1}{n^2}\right)\left(1+\frac{2^2}{n^2}\right) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \left(1+\frac{n^2}{n^2}\right)\right]^{\frac{1}{n}}.$$

7(c) Define Gamma function and Beta function. Evaluate: 13

$\int_1^{\frac{\pi}{6}} \cos^4 3x \sin^2 6x \, dx$ (using γ function and β function).

8(a) Find the perimeter of the cardiod $r = a(1-\cos\theta)$. 12

8(b) Find the area of all loops of $r = a\cos 3\theta$ 12

8(c) Find the volume of the solid generated by revolving the loop of $(x-4a)y^2 = ax(x-3a)$ about x-axis. 11

KHULNA UNIVERSITY OF ENGINEERING & TECHNOLOGY

Department of Mechanical Engineering

B. Sc. Engineering 1st Year 1st Term Examination, 2019

Hum 1105

(English)

Time: 3 Hours | Total Marks: 210

N.B.: i) Answer any THREE questions from each section in separate scripts.
ii) Figures in the right margin indicate full marks.

SECTION-A

1(a) Make sentence with the following structures using the words given in brackets. 14

i) Subj. + Intransitive verb + Adverb. (Sleep as verb).
ii) What +Subj. + Verb + Adv. of manner +Verb + Adj. complement. (Think and is as verb).
iii) Since + Subj. + Verb +Adj. complement, Subj. + Verb + Object. (is and complete as verb).
iv) Subj., + relative pronoun as subj. + Verb + Adv. of place, + Verb + Noun complement. (Work and is as verb).
v) Subj. + Transitive verb + Object. (Prepare as verb).
vi) Subj + Verb + Adv. of manner, So + Verb + Adv. (Work and succeed as verb).
vii) Subj. + Verb + not only +Object + but also + Object. (Write as verb).

1(b) Change the following words as directed and use them in sentences: 12
beauty (into verb), destroy (into noun), fame (into adjective), glory (into verb), study (into adjective), success (into verb).

1(c) Make a new word with each of the following prefixes and suffixes and use them in sentences: 09
auto _____, bi_____, co_____, cracy_____, er_____, logue_____.

2(a) Put in the correct form of verbs: 14

i) It was long since I (see) her last.
ii) He went away (leave) us behind.
iii) We (live) in London when the war started.
iv) Have you ever (be) to London?
v) Go on (write).
vi) I feel like (sleep).
vii) When was the book (buy)?

2(b) Make use of the following modals in sentences as asked in brackets. 12

i) Can. (To express offer)
ii) May. (To allow someone for something)
iii) Might. (To express uncertainty)
iv) Must. (To express logical deduction)
v) Had better. (To suggest somebody else)
vi) Be + to + bare form of verb. (To express command)

2(c) Make sentences with the following phrases and idioms: 09
blue blood, beat about the bush, at sixes and sevens, at one's wit's end, add fuel to the flame, acid test.

3(a) Transform the following sentences as asked in brackets. 14

i) Those students, who study hard, are future of a country. (Simple)
ii) He can't attend at the meeting because of his illness. (Complex)
iii) He can develop life because of his working hard. (Compound)
iv) Liza can't succeed in life, but is happy. (Complex)
v) He is as smart as Masum. (Comparative)
vi) Love leads to harmony. (Negative)
vii) Masum could play football when he was sixteen. (Simple)

3(b) Express the following notions/functions in sentence. 12
i. Ambition, ii. Boredom, iii. Compassion, iv. Desertion, v. Envy, vi. Fear.

3(c) Complete the following sentences with clauses as asked in brackets. 09

i) ..... is amazing. (Noun clause)
ii) Rakib, ... , is a doctor. (Adj. clause)
iii) ..... , he does well in exam. (Adv. clause)
iv) We call him ..... . (Noun clause)
v) Mamun lives in a village ..... . (Adj. clause)
vi) ..... , he can't attend at class. (Adv. clause)

4(a) Frame WH questions from the following answers: 14

i) There are five books on the table.
ii) He lost his son and this made him sad.
iii) His illness prevented him from going to college.
iv) He moved as slowly as a turtle.
v) He is looking for a job.
vi) He got the message from his sister.
vii) He is driving his friend's car.

4(b) Write one synonym and one antonym of each of the following words and use in sentence: 12

begin, refuse, dangerous, war.

4(c) Define Transitive verb, Intransitive verb and Infinitive with two examples for each of the definitions. 09

SECTION-B

5(a) Read the following sentence carefully and answer the questions that follow. 20

Only government organizations can't cover the whole spectrum of a country's development idea. A government organization plays a limited range of direction for development, of which the large scale comes with the help of the N. G. Os along the co-operation of peoples of a country. A government organization initiates the birth of a concept of development and the N. G. Os nurture it until it becomes a full grown shape, but N. G. Os are to run according to the rule of the country. An instance will clarify the importance of the role of the N. G. Os in a country in contrast to government's organizations. Poverty elimination marks a heart stricken concern in a country. Different types of govt. financial institutions – Banks, Insurances, projects, etc. are not absolutely able to eradicate it. In this case N. G. Os reach the root level of society, create awareness among the peoples about the causes of poverty and the ways they can get rid of it. So, government organizations are not fully capable of removing it. Thus, social development, human development, educational development, etc. recognize the complementary role of the N. G. Os. Different organs of a government endeavor to develop a society. Peoples representatives, law enforcing agencies, local administration, etc. work as spokesman of a government in this regard. Inspite of such effort a society can't involve in the complete stream of development until N. G. Os participate in the elimination of social ignorance. Only a society then enlightens itself being away from darkness. Here lies the role of N. G. Os.

Questions:

i) Why should we recognize the role of N. G. Os in a country?
ii) What does a government organization do at the beginning of a program? What is the result?
iii) How do you reflect the role of N. G. Os with an instance?
iv) How do N. G. Os contribute to the complete development of a society? And why?

5(b) Make a précis of the above written passage (Q. 5(a)) with a suitable title. 15

6(a)	Write a cause and effect paragraph on water pollution in Bangladesh.	15
6(b)	Amplify the idea contained in the following statement: Man is the architect of his own fortune.	20
7(a)	Prepare a report on your departmental library.	18
7(b)	Prepare a CV along with a job application.	17
8	Write a free composition on any one of the following: i) Digital Bangladesh. ii) Honesty and the importance of patriotism.	35