BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **IPE 405** (Theory of Machine Tool Mechanism)

Full Marks: 140   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Explain the concept of balancing a single rotating mass by two masses rotating in

    different planes.   (11⅓)

    (b) A rotating shaft carries four unbalanced masses 18 kg, 14 kg, 16 kg and 12 kg at
    radii 50 mm, 60 mm, 70 mm and 60 mm respectively. The 2nd, 3rd and 4th masses
    revolve in planes 80 mm, 160 mm and 280 mm respectively measured from the plane of
    first mass. They are also angularly located at 60°, 135° and 270° respectively measured
    clockwise from the first mass looking from this mass end of the shaft. The shaft is
    dynamically balanced by two masses, both located at 50 mm radii and revolving in
    planes midway between those of 1st and 2nd masses and midway between those of 3rd
    and 4th masses. Determine magnitudes of the balancing masses and their relative
    angular positions.   (12)

2. (a) What is critical speed of a shaft? Prove that critical speed is the same as the natural

    frequency of transverse vibration.   (9⅓)

    (b) What is viscous damping? Formulate the equation of motion of free damped
    vibrations and solve this equation when the roots are complex conjugate.   (14)

3. (a) A shaft of 180 mm diameter is supported in two bearings 2.5 metres apart. It carries
    three discs of mass 250 kg, 500 kg and 200 kg at 0.6 m, 1.5 m and 2 m from the left
    hand. Assuming the mass of the shaft 190 kg/m, determine the critical speed of the
    shaft. Youngs' modulus for the material of the shaft is 211 GN/m².   (11⅓)

    (b) A mass of 85 kg is supported on springs which deflect 18 mm under the weight of
    the mass. The vibrations of this mass are constrained to be linear and vertical and are
    damped by a dashpot which reduces the amplitude to one-quarter of its initial value in
    two complete oscillations. If a periodic force of $150\cos 50t$ N is applied at the mass in
    vertical direction.   (12)

    Find (i) The magnitude of damping force

    (ii) The periodic time of damped vibration

    (iii) Amplitude of forced vibration

    (iv) Amplitude of forced vibration at resonance.

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4. (a) Explain free torsional vibrations of a three rotor system. Compare the cases of two node and single node. **(12)**

(b) Two parallel shafts A and B of diameters 50 mm and 70 mm respectively are connected by a pair of gear wheels, the speed of A being 4 times that of B. The flywheel of mass moment of inertia 3 kg-m^2 is mounted on shaft A at a distance of 0.9 m from the gears. The shaft B also carries a flywheel of mass moment of inertia of 16 kg-m^2 at a distance of 0.6 m from the gears. Neglecting the effects of shaft and gear masses, calculate the fundamental frequency of free torsional oscillations and the position of node. Assume modulus of rigidity as 84 GN/m^2. **(11⅓)**

SECTION – B
There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) How does tool wear affect the vibration amplitude? Briefly explain lathe chatter considering two directional motion of cutting tool. **(16)**

(b) Show the interrelation between different theories and models of chatter. Under what conditions two degree of freedom theory will take place of single degree of freedom chatter theory? **(7⅓)**

Arnold's

6. (a) Briefly describe Arnold's model for self excited vibration. **(11⅓)**

(b) What are the main sources of vibration in machine tools? Discuss how unbalance and disturbances in drives and intermittent cutting induce vibration in machine tool. **(12)**

7. (a) Briefly discuss the effects of vibration on cutting condition and workpiece. **(12)**

(b) What is regenerative principle? Derive an expression of vibration for equivalent system under regenerative vibration. **(11⅓)**

8. (a) What is velocity principle. Discuss Vanderpol's model based on this principle. **(8)**

(b) Explain in detail "phase lag theory" proposed by Doi and Kate. **(8)**

(c) Briefly discuss the general concepts of mode coupling theory. **(7⅓)**

L-4/T-1/IPE   Date : 23/07/2013

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **IPE 401** (Machine Tools)

Full Marks : 280   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

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SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Is it possible to cut Non-standard threads by a typical general purpose lathe machine? If so, explain how does it possible?   **(10)**

   (b) In which method(s) of taper turning cross feed is activated by top slide of lathe machine? Explain them with necessary sketches.   **(20)**

   (c) Where do you find half-nut, worm gearing pitch increasing gearing in a typical lathe machine? Explain their purposes and related mechanisms.   **(16⅔)**

2. (a) Discuss the principle of differential indexing in Milling machine. Calculate the ratio of the differential change gears where the number of start of the corresponding worm is 4.   **(20)**

   (b) Explain the generating principle of gear cutting with necessary sketches. Discuss its advantages over the form cutting process.   **(10)**

   (c) What is strain-back effect? How does the clapper box mechanism in tool head of a shaper machine support the cutting tool against the strain-back effect? Explain.   **(16⅔)**

3. (a) What are the motions involved in helical gear cutting in Gear-shaper and in Gear Hobber? Explain them briefly.   **(20)**

   (b) What are the requirement of machine tool structure? What is the most suitable structural material? Justify your answer.   **(16⅔)**

   (c) Discuss the cases where the turret lathe is suitable. Also discuss its relative advantages over an Engine lathe.   **(10)**

4. (a) What should be the appropriate location of bearing in lathe spindle for better machining accuracy.   **(15)**

   (b) What do you understand by acceptance test? Explain the procedure of accepting a machine after purchase.   **(16⅔)**

   (c) Draw the schematic diagram of Ball-bearing and Roller-bearing. Also discuss the relative advantages over each other.   **(15)**
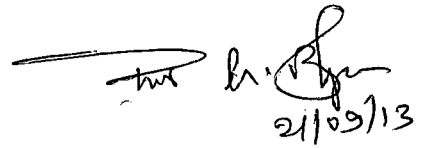
IPE 401

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Deduce the mathematical relationship among Z, R_n and φ for a Geometric Progression (G.P.) series. The requirement of minimum and maximum speed are 20 rpm and 900 rpm respectively. The number of speed steps is 12. Calculate the different speeds possible to attain with G.P. series. **(15)**

(b) What are the influences of d, n, m, T on kinetic energy of a gear designed of a given material and for a given power? **(15)**

(c) Draw all possible ray diagrams for a six-speed gearbox designed with sliding type cluster gears. Mention the helpful rules for designing this type of gear box and based on these rules select the best solution among the alternative ray diagrams you have drawn. **(16⅔)**

6. (a) Describe Wuelfel-Kopp Tourator with neat sketch. Deduce the expression for it's transmission ratio. **(16)**

(b) What properties should be considered during selecting working fluid for a Hydraulic drive system? Mention the advantages and disadvantages of hydraulic drive system. **(10)**

(c) Describe the working principle and design of a Twin gear pump with neat sketch. Derive the expression for its rate of delivery and required power. Calculate the flow rate (Q) for a Twin gear pump, if the module, pitch diameter and width of the gears are 2 cm, 50 cm, and 2 cm respectively. Consider the speed as 500 rpm. **(20⅔)**

7. (a) Draw a dovetail slideway. Mention it's advantages and disadvantages. How the clearance and wear are compensated for this type of slideway? **(20⅔)**

(b) Why recirculation of rolling elements in antifriction bearings are used in slideways? Explain. **(10)**

(c) Explain use of different materials for designing slideways. **(16)**

8. (a) Why numerical control machine tools are becoming popular in manufacturing industry? **(16)**

(b) Describe working principle of a directional control valve (spool value) with neat sketch as a hydromechanical control element. **(20⅔)**

(c) Calculate the speed of a 3 φ 4 pole stepper motor while receiving 3600 pulses per minute. **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1 B. Sc. Engineering Examinations 2011-2012

Sub : **IPE 407** (Ergonomics and Safety Management)

Full Marks: 210   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Explain in details about the approaches for assessing Manual Material Handling capabilities and for setting recommended workloads. **(15)**

    (b) Write in details about the primary symptom of HAVS. **(10)**

    (c) Write down the recommendations of seat backs on chairs used with computer workstation. **(10)**

2. (a) Write in brief about the visual defects. What are the guidelines for color selection? **(15)**

    (b) Describe the factors that affect the level of energy consumptions on a particular task. **(10)**

    (c) What are effects of wearing gloves on manual performance? **(10)**

3. (a) Explain why tissue compression stress and repetitive finger action should be avoided in designing hand tools. **(15)**

    (b) What is lumbar kyphosis? How can lumbar kyphosis be prevented while designing a seat properly? **(10)**

    (c) What is glare? How it can be avoided? **(10)**

4. (a) What is a workspace? Explain the effects of the presence of restraints, the effect of manual activity and the effects of apparel on workspace envelope. **(15)**

    (b) What do you understand by muscle metabolism? **(10)**

    (c) What do you understand by Noise Pollution? What are the health effects of excessive noise? **(10)**

IPE 407

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) What is the basis of Heinrich's Domino Theory? Briefly explain Frank Bird's modified version of this theory. **(20)**

(b) What are the significance of frequency rate and severity rate in measuring injury statistics? **(15)**

6. (a) What are the common guidelines for designing an effective egress system. **(20)**

(b) Differentiate 'Flash Point' from 'Fire Point'. What are the characteristics of flammable reactions? **(15)**

7. (a) Briefly explain the identification system for designating the hazards of a material developed by NFPA. **(20)**

(b) What do you mean by grounding and bonding? What are the major application area of flame detectors? **(15)**

8. (a) What are the common types of respiratory protective equipments? Describe the working principle of closed circuit type SCBA. **(15)**

(b) Write in brief what should be seated work surface height? **(10)**

(c) What is postural fixity? How can it be reduced? **(10)**

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **IPE 419** (Computer Integrated Manufacturing)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Give some examples of important industrial applications of robot.   **(10)**

   (b) Show the five types of joints commonly used in industrial robot construction. Also describe commonly used Body-and-Arm configurations.   **(15)**

   (c) Describe different sensors used in industrial robots.   **(10)**

2. (a) Draw truth tables and ladder logic diagrams for NAND, NOR and XOR gates.   **(12)**

   (b) Describe the working principles of incremental encoder and absolute encoder.   **(10)**

   (c) What is the main use of proximity switches? Describe different types of proximity switches.   **(13)**

3. (a) With neat sketches discuss different types of FMS layouts.   **(15)**

   (b) Describe different components of a FMS.   **(20)**

4. (a) Explain how CAD can assist at different phases of product design.   **(10)**

   (b) Briefly discuss applications of CAM in manufacturing planning and manufacturing control.   **(10)**

   (c) Discuss typical sequence of processes required for part fabrication with suitable example.   **(15)**

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Do you think using AGV instead of other material handling equipment is suitable for a manufacturing unit in Bangladesh – justify your answer.   **(6)**

   (b) What are the two different types of barcode reader? Briefly explain with application area.   **(8)**

   (c) What are the safety features that you need to consider in designing an automated material handling system?   **(6)**

   (d) For the following machine cell, derive the sequence of operation along with product flow: **(15)**

Machine	To				
From	A	B	C	D	E
A	---	25	30	15	20
B	5	---	20	35	15
C	15	20	---	20	25
D	10	5	---	---	10
E	20	---	---	25	---

IPE 419

6. (a) Briefly discuss the different steps in production flow analysis. **(8)**

   (b) There are three different attributes in grouping products into cells. Which one is the best out of three and why? **(6)**

   (c) Name six different types of automatic data capturing methods with appropriate example. **(6)**

   (d) Identify part families and corresponding machine groups for the following part machine matrix using "rank order clustering" technique: **(15)**

Part	Machine							
	1	2	3	4	5	6	7	8
A	1		1			1		
B					1		1	1
C							1	1
D	1		1					
E	1		1			1		
F					1			1
G		1		1			1	
H		1		1				1

7. (a) Using the notification scheme for defining manipulator configurations, draw diagrams of the following robots: (i) VVR, (ii) TVR : TR (iii) TRT : R. **(15)**

   (b) Distinguish Powered Lead through from Manual Lead through programming. **(10)**

   (c) Describe rapid prototyping and virtual prototyping. **(10)**

8. (a) Discuss different types of network linking devices. **(10)**

   (b) Explain ring topology with necessary sketch. What type of access control technique does it usually use? **(7)**

   (c) What do you understand by networking protocol? How does it contribute in transmission of data packets? **(9)**

   (d) Write short notes on: **(9)**

   (i) Intranet and Extranet

   (ii) Wireless media

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-4/T-1   B. Sc. Engineering Examinations 2011-2012

Sub : **IPE 403** (Project and Environmental Management)

Full Marks : 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this section. Answer any **THREE**.

1. (a) Project is not same as regular function. However some characteristics are common to both. Indicate the similar and dissimilar characteristics of a project and a regular function. **(8)**

(b) Project manager is often termed as "conflict manager" – discuss. **(7)**

(c) How can you distinguish economic analysis from financial analysis in project appraisal – explain with example. **(8)**

(d) For the following task table, draw the network diagram, calculate project duration, find the critical path and calculate slack time for each task: **(12)**

Task	Follower	Duration (day)
a	---	7
b	---	10
c	---	3
d	a, b	4
e	c	6
f	a, c	9
g	b, f	7
h	g	5
i	g, h	8
j	i	4

2. (a) Why do you need to submit a time-phased budget? Why committed and actual budgets are submitted along with the scheduled budget – discuss with example. **(8)**

(b) Briefly explain three different types of matrix organization structure with appropriate example. **(12)**

(c) For the following activity table, obtain a schedule to level the manpower requirement: **(15)**

Activity	Duration (day)	Manpower requirement
1 – 2	5	12
1 – 3	8	10
2 – 3	7	4
2 – 4	6	15
3 – 4	4	9
3 – 5	9	10

IPE 403 (IPE)

3. (a) What is the significance of "Linear responsibility chart"? How does it help in working with GANTT chart? **(7)**

(b) How can you compare third order cybernetic control mechanism with first order control? **(10)**

(c) For the following task table, find all possible crash times and corresponding costs for the project: **(18)**

Activity	Predecessor	Duration		Cost	
		N	C	N	C
a	---	4	3	40	70
b	a	3	3	30	30
c	b	5	3	50	80
d	b, c	4	2	40	80
e	d	3	3	40	40
f	d, e	4	1	20	80

4. (a) What are the special criteria that you need to have for being project manager? **(8)**

(b) What are the three main factors of a project that play a vital role in achieving target? How can you trade-off those three? **(7)**

(c) Iterative budget has several benefits over top-down and bottom-up budgets. Indicate those benefits separately with appropriate example. **(8)**

(d) For the following cash flow table, find the best suitable project of the two based on NPV and discounted pay back period (at 10% discount rate): **(12)**

Year	Project 1	Project 2
0	–3,00,000	–3,00,000
1	40,000	70,000
2	60,000	80,000
3	90,000	90,000
4	120,000	100,000
5	100,000	80,000
6	90,000	70,000
7	80,000	40,000
8	60,000	30,000

SECTION – B

There are **FOUR** questions in this section. Answer any **THREE**.

5. (a) Describe the role of CFC in environmental pollution and related international legislation or agreements. **(15)**

(b) Describe the effects of acid rain on lakes and streams. **(15)**

(c) What is "region of mixing"? **(5)**

IPE 403 (IPE)

6. (a) Describe, using a flow chart, the operation of ETP in a textile dyeing factory. **(15)**

   (b) Write a short note on Kyoto Protocol. **(15)**

   (c) Describe, using chemical formula, the reaction for biochemical oxidation. **(5)**

7. (a) What are the "Technical and Planning alternatives" of pollution prevention? **(15)**

   (b) Describe the history of environmental rules and regulations in Bangladesh. **(15)**

   (c) "Although, environmental legislations are being formulated and enforced in many countries recently, these issues caught attention of the British rulers quite long time ago"". State two such legislations. **(5)**

8. (a) There can be five different types of organization structure to complete a project. Describe all five with practical application. **(15)**

   (b) Discuss work breakdown structure for a bridge construction project. **(12)**

   (c) Briefly explain different types of data collection process in project monitoring. **(8)**