NCU-FRM-29

NCU THE NORTHCAP UNIVERSITY	**Question paper for Minor Test-II** **School of Engineering** **Programme : B.Tech** **Course Name: Operations Research** **Course Code : MEL317** 15 OCT 2016	**Review Date: 01/03/2014** **Semester: Odd/V** **Session: (July-Dec)** **Maximum Marks:20** **Duration :1.00 hr** **Sheet 1 of 2**

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.
3.Use of normal probability distribution chart is allowed.

Course Outcomes

CO3 : Students will be able to execute the project by understanding the critical path in the network & their buffer time .
CO4 : Students will be able to apply the concept of Assignment algorithm to assign jobs/Workers to the machines systematically.
CO5 : Students can minimize transportation cost between the supplier & parent company by selecting the optimum route using different algorithms.

PART-A

	Max Marks	Related CO's
Q.1. The marketing director of a multi unit company has a problem in assigning 4 senior managers to four zones. From the past experience, he knows that the index of **effectiveness** by sales, operating cost etc that depends on manager zone combination. The effectiveness of managers are given below:	6	CO4

	I	II	III	IV
A	42	35	28	21
B	30	25	20	15
C	30	25	20	15
D	24	20	16	12

Assign the zones to the managers so as to ***maximize*** the total effectiveness.

PART-B

Q.2. For the following activities:	7	CO3

Activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Optimistic time	1	1	2	1	2	2	3
Most likely time	1	4	2	1	5	5	6
Pessimistic time	7	7	8	1	14	8	15

(i) Draw the project network.
(ii) Find the expected duration and variance of each activity. What is the expected project length?
(iii) Calculate the standard deviation for the project length.
(iv) Calculate the duration of the project that will have 95% chance of completion.

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NCU THE NORTHCAP UNIVERSITY	**Minor II Test**	**Review Date:**
	School of Engineering	**Semester: Odd 1st & 3rd** **Session: July-Dec 2016**
	Programme: M.Tech Mech. Engg. **Course Name: Introduction to FEM** 15 OCT 2016 **Course Code : MEL510**	**Maximum Marks: 15** **Duration :1 hr**
		Sheet 1 of 1

Note: 1. All questions are compulsory. 2. Marks are indicated against the questions.
3. Use of calculator is permitted.

Course Outcomes:

Upon successful completion of this course the students should be able to:

CO1: Explain the basics of Finite element method including its advantages and relevance to engineering and industrial applications.

CO2: Solve boundary value problems using weighted residual methods

CO3: Derive stiffness matrix for 1 and 2 dimensional elements

CO4: Assemble discrete elements to form the global FEM matrix equation of simple 1-D or 2-D problems

CO5: Use FEM software for design and evaluation of simple mechanical structures like beams, plates, and trusses in static and dynamic modes

CO6: Use FEM software to solve simple heat conduction and fluid flow problems

Section A

	Max. marks	Related CO's
Q1. What are the properties of shape functions (list minimum 5 points)?	2	CO3
Q2. What are the differences between constant-strain triangle and linear-strain triangle?	2	CO3
Q3. What is the mathematical relationship between: a) global (x,y) and natural (ξ,η) coordinates in constant-strain rectangular element? b) Stress and strain matrices in an isotropic material	3	CO3,4

Section B

Q4. The initial positions of nodes 1 and 2 of a 2-noded bar element in global coordinates are 21 cm and 28 cm, respectively. After loading, the new positions of these nodes are 21.1 cm and 27.8 cm, respectively. a) What is the displacement of the point which initially was at 23.7 cm? b) What is the strain at the midpoint of the element?	3	CO4
Q5. a) Determine the shape functions for a 3-noded bar element in natural coordinates. using the polynomial method. b) Determine the strain-displacement matrix for 3-noded bar element.	5	CO3

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	Question paper for Minor II Test	Review Date:
NCU THE NORTHCAP UNIVERSITY	School of Engineering	Semester: Odd VII Session: July-Dec 2016
	Programme: B-Tech Mech. Engg. Course Name: Introduction to FEM 15 OCT 2016 Course Code : MEL451	Maximum Marks: 15 Duration :1 hr
		Sheet 1 of 1

Note: 1. All questions are compulsory. 2. Marks are indicated against the questions.
3. Use of calculator is permitted.

Course Outcomes:

Upon successful completion of this course the students should be able to:
CO1: Explain the basics of Finite element method including its advantages and relevance to engineering and industrial applications.
CO2: Derive stiffness matrix for 1 and 2 dimensional elements
CO3: Assemble discrete elements to form the global FEM matrix equation of simple 1-D or 2-D problems
CO4: Use FEM software for design/evaluation of simple structures like beams and trusses in static mode

Section A

	Max. marks	Related CO's
Q1. What are the properties of shape functions (list minimum 5 points)?	2	CO1
Q2. What are the differences between constant-strain triangle and linear-strain triangle?	2	CO2
Q3. What is the mathematical relationship between global (x,y) and natural (ξ,η) coordinates in a constant-strain rectangular element?	2	CO2

Section B

Q4. a) Determine the shape functions for a 2-noded bar element in natural coordinates. using the polynomial method. b) The initial positions of nodes 1 and 2 of a 2-noded bar element in global coordinates are 21 cm and 28 cm, respectively. After loading, the new positions of these nodes are 21.1 cm and 27.8 cm, respectively. What is the displacement of the point which initially was at 23.7 cm?	3	CO2
Q5. Determine the shape functions for a CST element in: a) natural coordinates, b) global coordinates	6	CO3

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	Question paper for Minor-2	Review Date: 01/03/2014
	School of Engineering	Semester: Odd I/III * Session: (July-Dec)
	Programme: M-Tech Course Name: Mechatronics Course Code : MEL540 15 OCT 2016	*Maximum Marks: 15 *Duration :1.00 hrs
		Sheet 1 of 1

Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.

Course Outcomes

CO1 – Categorize traditional systems and Mechatronic systems.
CO2 - Plan and design possible solutions for a Mechatronic approach.
CO3 - Select proper sensors and actuators for a Mechatronic or Robotic application.
CO4- Write a PLC Program for Mechatronics application

	Marks	CO's
Q1. Explain the working of differential amplifier with neat sketch also write the application where it used in industry.	4	CO2
Q2. Write a PLC program for following sequence of logic gates and also verify the truth table of each logic gate. • AND • OR • NAND • NOR • NOT • X0R	6	CO4
Q3. What is transfer function? Define a controller which maintains the pressure at 20 bars without overshoot and steady state error in chemical plant.	5	CO3

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NCU THE NORTHCAP UNIVERSITY™	**Minor I**	**Review Date:**
	School of Engineering & Technology	**Semester: Odd III** **Session: (July-Dec)**
	Programme: B-Tech **Course Name: Energy Conversion** 15 OCT 2016 **Course Code : MEL 202**	**Maximum Marks: 20** **Duration :1 hrs**
		Sheet 1 of 2

Note: 1. All questions are compulsory.
3. Calculator permitted.

CO1 - Demonstrate understanding of several fundamental concepts of energy conversion
CO2 - Select & apply appropriate methods & principles of thermodynamics to model & analyze engineering situations
CO3 - Estimate heat balance, work & efficiency of thermal systems

Section A (2x5 = 10)

Q1. List atleast four efficiency improvement devices used in thermal power plants. CO1
Q2. Why the thermal efficiency of Otto cycle is higher than diesel cycle? CO1
Q3. Explain the role of condenser in thermal power plant? CO2
Q4. What is a super critical boiler? CO2
Q5. How does the dryness fraction of steam affect turbine performance? CO1

Section B (6+4 = 10)

Q6. The minimum pressure and temperature in an Otto cycle are 100 kPa and 27°C. The amount of heat added to the air per cycle is 1500 kJ/kg. (i) Determine the pressures and temperatures at all points of the air standard Otto cycle. (ii) Also calculate the specific work and thermal efficiency of the cycle having compression ratio of 8:1. CO3, (6)

Take for air : c_v = 0.72 kJ/kg K, and γ = 1.4.

Q7. Explain working of Rankine cycle. Suggest a few ways of improving the efficiency of Rankine cycle? CO1

(4)

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	Question paper for Minor 2	
	School of Engineering	Semester: Odd/III
NCU THE NORTHCAP UNIVERSITY	Programme: M-Tech Course Name: Design for Manufacturing and Assembly Course Code : MEL-603-MD 15 OCT 2016	Session: July-Dec 2016 Maximum Marks: 15 Duration :1 hrs
		Sheet 1 of 2

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.

1. *Wrt* to DFA why it is important to avoid flexible connections in an assembly. Explain it with the help of a diagram. Also explain the significance of design for unrestricted access in an assembly. **[1]**

2. Explain the terminology used in a wiring harness assembly and mention the different types of electrical connections are used. **[2]**

3. While designing components for high speed automation what kind of problems are generally encountered in automatic feeding? Mention at least 5 design rules for designing components/products for automation? **[3]**

4. Mention and explain in brief two basic technologies used for assembly of printed circuit boards? Which one is better *wrt* DFA and why? **[3]**

5. What is a turret and why it is used in machine tools? Mention atleast 5 design guidelines for design for machining for both rotational and non-rotational components. **[3]**

6. Mention two different types of injection mechanisms used in injection molding? Is it possible to mold an external thread on an injection molded component or should one go for secondary machining operations? **[3]**

Q8. Explain about 7- QC tools in details. 3 CO 5

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NCU THE NORTHCAP UNIVERSITY	**Question paper for Minor-II Test** **School of Engineering** **Programme: B.Tech** **Course Name: Metal Cutting and Metrology** **Course Code : MEL201**	**Review Date: 01/03/2014** **Semester: Odd III** **Session: (July-Dec)** **Maximum Marks: 15** **Duration :1 hr** **Sheet 1 of 1**

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.
3. Use of Calculator is permitted.

15 OCT 2016

Course Outcomes

CO1	To evaluate various cutting parameters of a cutting tools under different cutting conditions.
CO2	To apply various theories of metal cutting to compute various forces involved in me
CO3	To determine optimum cutting speeds to obtain better machinability at lower costs
CO4	To identify the different types of tool wear, their mechanisms & use of suitable cutting fluid.

	Max Marks	Related CO's
PART-A		
1. *Answer the following questions:*		
a. Write the Taylor's tool life equation.	1	CO1
b. The following equation represents a generalized tool life equation: $VT^{0.13} f^{0.6} d^{0.3} = C$ A 60 min tool life was obtained, using following conditions: V=40 m/min, f=0.4 mm, d=1.0 mm. Calculate the effect on tool life if speed feed & depth of cut are increased (i) individually by 25 % (ii) together by 75 %	4	CO1
PART-B		
2. *Answer the following questions:*		
a. What is a cutting fluid. What are its properties.	2	CO3
b. Derive an expression for the optimum cutting speed.	3	CO3
3. *Answer the following questions:*		
a. Diagrammatically show the flank wear and crater wear.	1	CO4
b. Explain the mechanisms of tool wear, with the help of neat & clean diagrams.	4	CO4

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NCU THE NORTHCAP UNIVERSITY (FORMERLY ITM UNIVERSITY, GURGAON)	**Minor Test II**	**Review Date:**
	School of Engineering	**Semester: Odd I** **Session: July-Dec 2016**
	Programme: M-Tech(Part-time) **Course Name: Numerical Methods and Computer Programming** **Course Code : MEL500**	**Maximum Marks: 25** **Duration : 1 hour**
		Sheet 1 of 1

Notes: 1. All questions are compulsory. 2. Marks and related course outcomes are indicated against the questions. 3. Calculator is permitted.

Course Outcomes

Upon successful completion of this course the students should be able to:
CO1 – Explain how errors can occur in numerical solution and how to minimize them; CO2 – Use Microsoft Excel fornumerical solution; CO3 – Do curve fitting; CO4 – Solve differential equations numerically; CO5 – Solve algebraic equations numerically; CO6 – Formulate and solve optimization problems

Section A

		Max. marks	Related CO's
Q1.	Use Stirling's formula to evaluate f(1.22), given f(1.0) = 0.841 , f(1.1) = 0.891 , f(1.2) = 0.932 , f(1.3) = 0.963 , f(1.4) = 0.985	05	CO5

Section B

Q2. Find the first and second derivatives of f(x) at x = 1.5 if (5 x 2=10) CO5

x	1.5	2.0	2.5	3.0	3.5	4.0
y = f(x)	3.375	7.000	13.625	24.00	38.875	59.00

Q3. Given that, (5 x 2=10) CO5

x	4.0	4.2	4.4	4.6	4.8	5.0	5.2
log x	1.386	1.435	1.481	1.526	1.568	1.609	1.6487

Evaluate $\int_4^{5.2} logx\ dx$ by

a) Trapezoidal rule
b) Simpson's 3/8 rule

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	Minor Test-II	Review Date:
	School of Engineering & Technology	Semester: Odd (III)
	Programme: B-Tech	Session: (July-Dec) 2016-17
	Course Name: Theory of Machines	Maximum Marks: 20
	Course Code : MEL 206 17 OCT 2016	Duration :1 hr
		Sheet 1 of 2

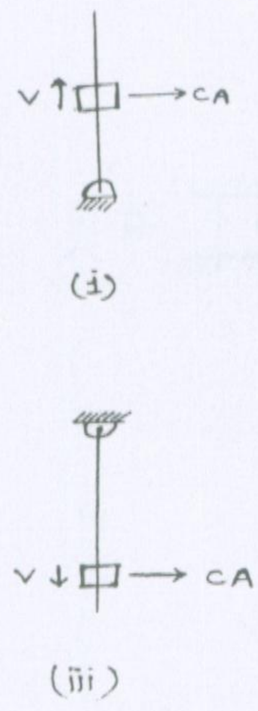
Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.
3. Calculator permitted.*

COURSE OUTCOMES: (CO)

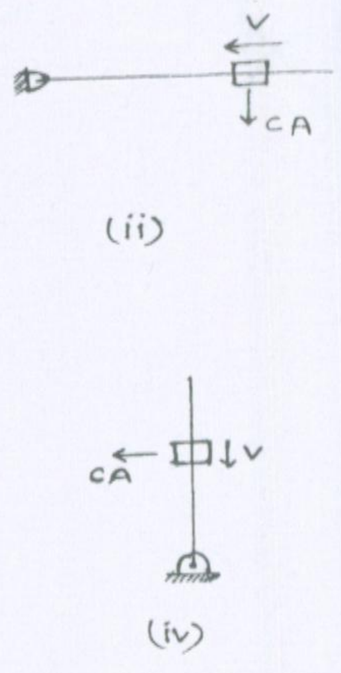
CO4: To study about velocity analysis using I.C & relative velocity methods.
CO5: To understand the acceleration analysis and Coriolis acceleration.

Section-A

1. While drawing the circle diagram in Instantaneous Centre method of velocity analysis what do the points/tick marks and a line joining any two points/tick marks represent? [2] CO4
2. Determine the direction of angular velocity of the rotating link (clockwise or anticlockwise) where
   V - Sliding velocity of the slider
   CA - coriolis component of acceleration [4] CO5



(i)



(ii)

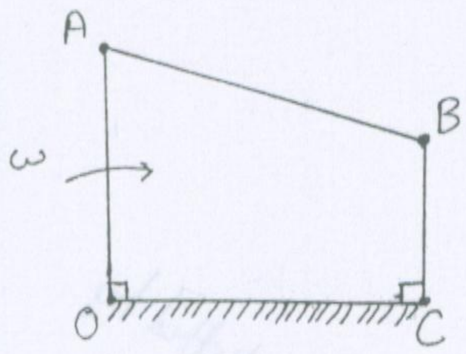
(iii)

(iv)

3. State the Aronhold kennedy theorem of three instantaneous centres. [2] CO4

Section-B

4. For the given configuration of 4 bar mechanism using Relative Velocity method ,determine (i) Velocity pf point B (ii) Velocity of point B with respect to A (iii) Angular Velocity of link AB (iv) Angular Velocity of link BC [4] CO4



AO = 10 cm
BC = 3 cm
ω_{AO} = 8 rad/s
(clockwise)

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NCU THE NORTHCAP UNIVERSITY (FORMERLY ITM UNIVERSITY, GURGAON)	**Question paper for Minor II**	**Review Date: 01/03/2014**
	School of Engineering	**Semester: Odd VII** **Session: Jul-Dec, 2016**
	Programme: B-Tech **Course Name: Refrigeration and Air Conditioning** **Course Code : MEL 405** 17 OCT 2016	**Maximum Marks: 20** **Duration : 1hr** **Sheet 1 of 1**

Note: 1. All questions are compulsory.
2. Calculator is permitted.

CO 3: To understand simple vapour compression refrigeration system.
CO 4: To understand methods of improving COP of vapour compression refrigeration system.

	Marks	CO(s)
SECTION A (10 Marks)		
1. Draw simple vapor compression refrigeration (VCR) cycle on p-h and T-s diagrams when vapor at compressor suction are superheated, and mention all the thermodynamic processes.	2+2	CO3
2. What is the effect of condenser and evaporator pressures on the COP of VCR system?	1+1	CO3
3. Why design of evaporator is critical to the efficiency of VCR system?	1	CO3
4. Replacing isentropic expansion with isenthalpic in VCR cycle leads to loss in refrigerating effect. Propose an idea to recover that loss.	1	CO3
5. What is a flash chamber? And what is the purpose of installing it in VCR systems?	1	CO4
6. Which are the different types of intercoolers possible to use for running multi stage VCR systems?	1	CO4
SECTION B (10 Marks)		
7. A cold storage plant of 15 TR capacity uses vapour compression refrigerator running on Freon-12. The evaporator and condenser temperatures are -10 °C and 30 °C respectively. The liquid refrigerant is sub-cooled to 24 °C before expansion and vapor are superheated by 7 °C before leaving the evaporator. The compression of refrigerant is reversible adiabatic and a double acting compressor operating at 980 rpm with stroke-to-bore ratio of 1.3 is used to run the refrigeration system. Determine the following: i. Mass flow rate of the refrigerant required to be circulated ii. Theoretical piston displacement per minute iii. Theoretical power required iv. Heat removal rate in the condenser v. Theoretical bore and stroke of the compressor Assume: Specific heat (c_p) of liquid and superheated refrigerant is 1.23 and 0.73 kJ/kg-k respectively. Saturation properties are given below: ○ Specific enthalpy and entropy at the saturation temperature of -10 °C are: h_l = 26.9 kJ/kg, h_g = 183.2 kJ/kg, s_l = 0.11 kJ/kg-K, s_g = 0.7 kJ/kg-K, v_g = 0.077 m^3/kg. ○ Specific enthalpy and entropy at the saturation temperature of 30 °C are: h_l = 64.6 kJ/kg, h_g = 199.6 kJ/kg, s_l = 0.24 kJ/kg-K, s_g = 0.685 kJ/kg-K.	10	CO4

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NCU THE NORTHCAP UNIVERSITY	**Question paper for Minor Test -II**	**Review Date:**
	School of Engineering/ Mechanical Engineering	**Semester: Odd** **Session: (July-Dec) 2016**
	Programme: B-Tech **Course Name: Machine Design 1** **Course Code : MEL305** 17 OCT 2016	**Maximum Marks: 40** **Duration :1.00 hr**
		Page 1 of 2

Note: 1. All questions are compulsory. Draw the neat sketches as per requirement. Assume any missing data
2. Marks are indicated against the questions.
3. Calculator is permitted.

Course Outcomes:

CO3: Design of riveted joints as per IBR and shafts design based on strength, manufacturability, and cost.
CO4: Select bearing for a given design problem based on requirements such as life, reliability and cost.
CO6: Design of belt drive system on the basis of design requirements such as strength, power transmission, availability and cost.

	Max. marks	Related CO's

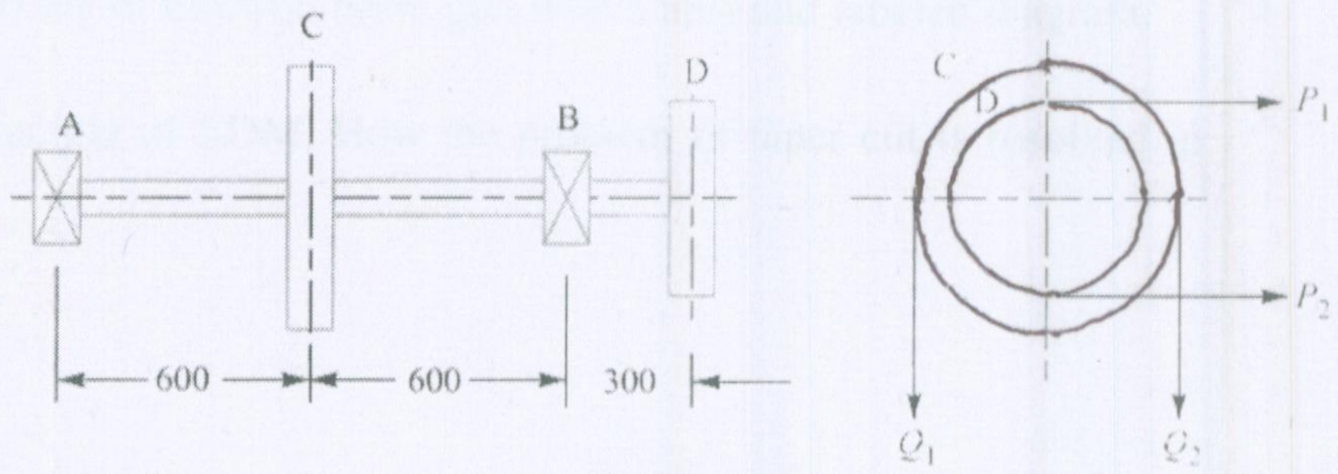
Part A

Q1. Derive the relation for stresses when key is equally strong in shearing and crushing **(5) CO3**

Q4. Explain the variation of coefficient of friction with bearing characteristic number also explain the bearing modulus. **(5) CO4**

Part B

Q4. A horizontal shaft AD supported in bearings at A and B and carrying pulleys at C and D is to transmit 75 kW at 500 r.p.m. from drive pulley D to off-take pulley C, as shown in Fig. Calculate the diameter of shaft. The ratio of tensions of both belts are 2:1, radius of pulley C = 220 mm, radius of pulley D = 160 mm, allowable shear stress = 45 MPa **(10) CO3**



All dimensions in mm.

Q5. A V-belt is driven on a flat pulley and a V-pulley. The drive transmits 20 kW from a 250 mm diameter V-pulley operating at 1800 r.p.m. to a 900 mm diameter flat pulley. The centre distance is 1 meter, the angle of groove is 40° and $\mu = 0.2$. What will be the number of belts required if belts having 230 mm^2 cross-sectional area are used. Assume the suitable data if required. **(10) CO6**

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NCU THE NORTHCAP UNIVERSITY	**THE NORTCAP UNIVERSITY**	**Semester : VIII ME** **Session: 2016-2017**
	Minor-II Examination ,October, 2016	**Total Marks: 15** **Duration: 1 Hrs.**
	School of Engineering & Technology	
	Programme: B-Tech.	
	Course Name: Non Conventional Energy Resources **Course Code: MEL-455**	

- **All questions are compulsory.**
- **This Question paper consists of 3 questions**
- **Please write question number on your answer sheet according to question paper**

Course Outcome

CO1: Conversant with various types of Non Conventional Energy Resources.
CO2: Understand , analyze and improve the application of NCER ,and optimize.
CO3:Evaluate and select appropriate NCER for a given situation.
CO4:Able to design and implement a project for a NCER.

SECTION-A

Questions **Marks** **Related Cos**

Q.1 Write short answers. Each question carries one mark. (5) **CO1,CO2,CO4**

(a) What is geothermal energy?
(b) Distinguish between battery and the fuel cell.
(c) What do you understand by hydrogen economy?
(d) Describe the basic theory of electrochemistry applied to fuel cell.
(e) What is biomass ? What are the different sources to extract biomass energy?

SECTION-B

Q.2 What is the principle of ocean thermal energy? Describe with the help of a simple schematic diagram the process of an ocean thermal energy conversion based on steam cycle. **(5) CO2, CO3**

Q. 3 (a) What are the environmental effects of geothermal energy? **(2) CO1,CO2,CO3**

(b)With a neat diagram discuss the biomass gasification method. **(3) CO1, CO4**

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THE NORTHCAP UNIVERSITY	**Minor II** **School of Engineering** **Programme: B-Tech** **Course Name: Heat Transfer** **Course Code : MEL 302**	**Review Date: 01/03/2014** **Semester: Odd / V** **Session: (Jan-May) 2015** **Maximum Marks: 20** **Duration :1 hr** **Sheet 1 of 1**

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.
3. Calculator is permitted.

Course Outcomes - The students should be able to:

CO3 - Understand analytical techniques to find temperature distribution and heat flow in one-dimensional steady state and transient heat conduction problems.
CO4 - Design cooling fins and typical heat exchange equipment's used in practice & their suitability for particular application.
CO6 - Select appropriate analytical or numerical techniques to find temperature distribution and heat flow.

SECTION- A (10 marks)

	Marks	Related CO's
Q1. What is lumped heat capacity analysis? Write down the condition required to use lumped heat capacity analysis?	3	CO3
Q2. Write an expression for overall heat transfer coefficient (U) for a double pipe heat exchanger. Explain the significance of various terms in this expression.	3	CO4
Q3. Steel balls 12 mm in diameter are annealed by heating to 1150 K and then slowly cooling to 400 K in an air environment for which ambient air temperature is 325 K and convection heat transfer coefficient is 20 W/m^2 K. Assuming the properties of the steel to be thermal conductivity is 40 W/m K, Density is 7800 kg/m^3 and specific heat at constant pressure is 600 J/kg K, estimate the time required for the cooling process.	4	CO3, CO6

SECTION- B (10 marks)

Q4. A turbine blade 6 cm long and having a cross-sectional area 4.65 cm^2 and perimeter 12 cm, is made of stainless steel having thermal conductivity 23.3 W/m K. The temperature at the root is 500°C. The blade is exposed to a hot gas at 870°C. The convective heat transfer coefficient between the blade surface and gas is 442 W/m^2 K, determine the fin efficiency and fin effectiveness of the blade. Assume the tip of the blade to be insulated.	5	CO4, CO6
Q5. A counter flow double pipe heat exchanger is to heat water from 20°C to 80°C at a mass flow rate of 1.2 kg/s. The heating is to be accomplished by geothermal water available at 160°C at a mass flow rate of 2 kg/s. The inner tube is thin-walled and has a diameter of 1.5 cm. If the overall heat transfer coefficient of the heat exchanger is 640 W/m^2 K, determine the length of the heat exchanger required to achieve the desired heating.	5	CO4, CO6

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NCU	**Question paper for Minor-2**	Review Date: 01/03/2014
	School of Engineering	Semester: Odd III/VII * Session: (July-Dec)
	Programme: B-Tech (OE-CSE) **Course Name: Mechatronics & Robotics** **Course Code : MEL459** 18 OCT 2016	*Maximum Marks: 15 *Duration :1.00 hrs
		Sheet 1 of 1

Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.

Course Outcomes

CO3-select proper sensor & actuators for Mechatronics
CO5 – Categorize different types of Robot used in industry.
CO6– Perform kinematics analysis of Robots

	Marks	CO's
Part A		
Q1. Write the steps of inverse of transformation matrix	2	CO6
Q2. Draw the neat figure of TRR Robot.	2	CO5
Q3. Explain how to find the gain in non-inverting amplifier with neat figure.	3	CO3
Part B		
Q1. A point P in space is defined as ${}^{B}P = [5, 3, 4]^{T}$ relative to frame B and is attached to the origin of the reference frame A and is parallel to it. Apply the following transformations to frame B and find ${}^{A}P$. • Rotate 90^{o} about x-axis • Then translate 3 units about y-axis, 6 unit about z-axis and 5 units about the x-axis • Then, rotate 90^{o} about the z-axis.	5	CO6
Q2. For the following frame, find the values of missing element and complete the matrix representation of the frame $F = \begin{bmatrix} ? & 0 & -1 & 5 \\ ? & 0 & 0 & 3 \\ ? & -1 & 0 & 2 \\ 0 & 0 & 0 & 1 \end{bmatrix}$	3	CO6

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NCU THE NORTHCAP UNIVERSITY	**Minor 2 Examination**	**Review Date:**
	School of Engineering and Technology	**Semester: Odd VII**
	Programme: B-Tech (ME) ONLY ME STUDENTS **Course Name: Mechatronics and Robotics (Departmental Elective)** **Course Code : MEL459** 18 OCT 2016	***Session: July – Dec 2016** ***Maximum Marks: 30** ***Duration :01 hr.**
		Sheet 1 of 1

Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.

Course Outcomes

CO2 - Kinematics and Dynamics analysis of Robotics Movement.
CO3 – Differentiate types of sensors and actuators used in robotics
CO4 – Write programming in PLC

Q. 1.	Define an industrial robot.	**03 marks**	CO2
Q. 2.	Define the following terms: i. Degree of Freedom ii. Smart Sensor iii. Kinematic analysis of robots	**06 marks**	CO2, CO3
Q. 3.	What do you mean by redundancy of a robot?	**03 marks**	CO2
Q. 4.	What are the common work configurations used by robots? Why should you be concerned about work envelope shape when installing a robot for a particular application?	**10 marks**	CO2
Q. 5.	What do you mean by PLC? Explain its structure, functioning and need to develop a PLC.	**08 marks**	CO4

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[redacted]	**Minor 2**	Review Date:
	School of Engineering & Technology	Semester: Odd(V)
	Programme: B-Tech (Mechanical Engineering) **Course Name: Material Science** **Course Code : MEL 310** 18 OCT 2016	Session: (July-Dec) *Maximum Marks:20 *Duration :1 hrs
		Sheet 1 of 1

Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.

Course Outcome
CO3: Study of Effect of Phase Transformation on the Mechanical Properties of Material
CO4: Study of effect of Heat Treatment on the Microstructure & properties of Steel.

Section A

	Marks	CO
1) Why is hardening followed by tempering? What are the different quenching media that are used for heat treatment?	2	4
2) FCC crystals have more packing density than BCC crystal yet why solubility of carbon in FCC form is higher than BCC form? Which microstructure in eutectoid steel has maximum hardness? Give reason.	3	3
3) With the help of creep curve explain the various stages. How is Toughness different from Resilience?	2	3

Section B

4) What is the importance of TTT diagram? What are the various transformations? Two metals **A** (melting point 800C) and **B** (melting point 600C) form a binary isomorphous system. An alloy having 35% B has 75% solid and rest liquid whereas an alloy having 55%B has 25% solid at 700C. Estimate the composition of solidus and liquidus at the above temperature.	6	3
5) Draw and write the salient points & state various reactions taking place in Iron-Carbon equilibrium phase diagram.	7	4

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NCU THE NORTHCAP UNIVERSITY	**Question paper for Minor - 2 *** **School of Engineering** **Programme: B-Tech/ M-Tech/MBA** **Course name: Project Management** **Course Code : MEL 613 IP** 19 OCT 2016 (Prof. OJHA'S BATCH ONLY)	**Review Date:** **Semester: Odd** **Session : (July-Dec) 2016** **Maximum Marks : 30** **Sheet 1 of 2**

Note: 1. There are 3 questions in paper. All questions are compulsory. *
2. Marks are indicated against the questions.

CO1 – Demonstrate/ understand the basic elements of Project Management relevant in real life domain.
CO2 – Solve Project appraisal decision making problems.
CO3 – Demonstrate/ understand/ analyze/ represent projects using GANTT Chart/ PERT/ CPM approaches.
CO4 – Utilize the PM softwares and demonstrate understanding of a holistic Project journey.

Q1 **CO4 (Marks: 3+3+2)**

(a) Briefly define, with a diagram, the following:-
(i) Activity
(ii) Event
(iii) Path
in a network construction.
(b) Mention, briefly, the three roles of the Steering Committee in the Project Management office.
(c) Mention two advantages and two disadvantages of a 'Pure' project organization.

Q2 **CO3 (Marks: 3+3+3+2+3)**

The activity details of a product are listed (time in days):

Activity/Time	Pessimistic	Most likely	Optimist	Predecessors
A	1	4	7	-
B	2	2	2	-
C	2	5	8	A
D	3	4	5	A
E	4	6	8	C,B
F	0	0	6	C,B
G	3	6	9	D,E

(a) Draw the network using the AON approach.
(b) Mention the expected time, variance and the slack for each activity.
(c) Show the critical path using forward and backward passes and provide the project duration.
(d) Can the activity G be delayed without affecting the project duration? If yes, by how muc?
(e) If the project duration is to be reduced to 18 days, what is probability of it timely completion?

Q3 **CO1 (Marks:4+4)**

Draw the AOA and AON network diagrams of the following activities and their predecessors.

Activity	Pessimistic
A	-
B	-
C	A
D	A,B
E	A,B
F	C
G	D,F
H	E,G

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Rohja 6/10/16

6/10/16

PTO

NCU	**Question paper for Minor Test 2**	
	School of Management	**Semester:** Odd III *Session: (Jul-Dec)
	Programme: MBA ONLY **Course Name: Project Management** (Dr. Aparna's batch) **Course Code: MEL613IP** 19 OCT 2016	*Maximum Marks: 20 *Duration :1 hr
		Sheet 1 of 1

Note: 1. All questions are compulsory. *
2. Marks are indicated against the questions.

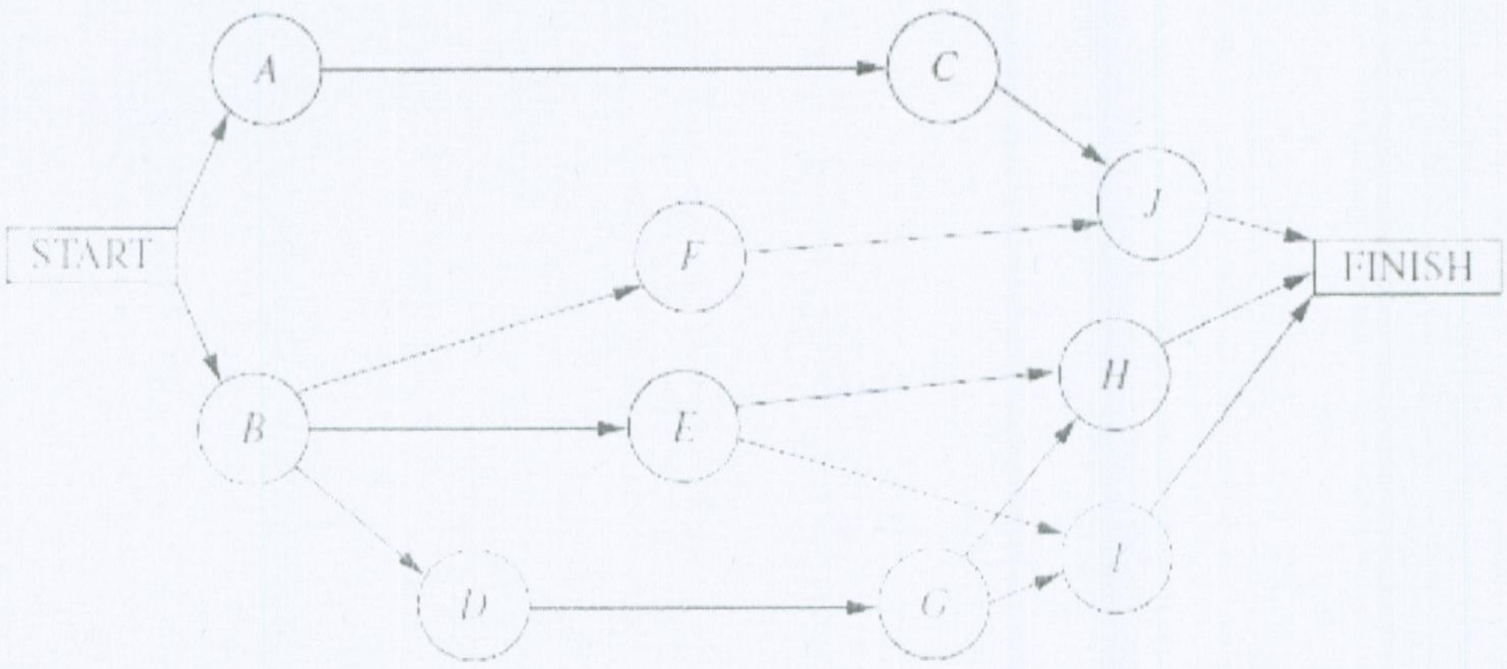
Course Objectives:

1. To understand Project Budgeting and its techniques
2. To understand Project Scheduling

Q1. Write short notes on: **(2x 4=8 marks)**

a. Types of Project Budgeting
b. Zero Based Budgeting
c. Activity and Milestone
d. Gantt Chart

Q2 The Singaporean Aircraft Co. is ready to begin a project to develop a new fighter airplane for the Singapore. Air Force. The company's contract with the Department of Defense calls for project completion within 100 weeks, with penalties imposed for late delivery. The project and their precedence relationships are shown in the following project network.



Using the PERT three-estimate approach, the usual three estimates of the duration of each activity have been obtained as given below.

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Date:	Date:

Activity	Optimistic Estimate	Most Likely Estimate	Pessimistic Estimate
A	28 weeks	32 weeks	36 weeks
B	22 weeks	28 weeks	32 weeks
C	26 weeks	36 weeks	46 weeks
D	14 weeks	16 weeks	18 weeks
E	32 weeks	32 weeks	32 weeks
F	40 weeks	52 weeks	74 weeks
G	12 weeks	16 weeks	24 weeks
H	16 weeks	20 weeks	26 weeks
I	26 weeks	34 weeks	42 weeks
J	12 weeks	16 weeks	30 weeks

a) Find the estimate of the mean and variance of the duration of each activity.
b) Calculate free float, total float and interfering float
c) Find the critical path.
d) Find the approximate probability that the project will finish within 100 weeks.

Z-Chart

X	0.0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817

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	Minor II	**Review Date: 01/03/2014**
	School of Engineering	**Semester: Odd / I**
	Programme: B-Tech **Course Name: Introduction to Mechanical & Production Engineering** **Course Code : MEL 170** 19 OCT 2016	**Session: (July-Dec)** **Maximum Marks: 20** **Duration : 1 hr**
		Sheet 1 of 1

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.
3. Steam Table and Calculator is permitted.

Course Outcomes

CO1 – To understand the basic concepts of thermal engineering, to identify and formulate the engineering problems.
CO2 – To understand the concept of design and manufacturing.
CO3 – Able to design and conduct experiments, as well as to analyze and interpret data.

	Max Marks	Related CO's
Section – A (8 Marks)		
Q1. How would you find dryness fraction of steam?	1	CO1
Q2. What are boiler accessories? Name all of them.	2	CO1, CO3
Q3. Write down the air standard efficiency of Otto cycle.	2	CO1, CO3
Q4. Define the following terms: (i) Compression ratio (ii) Creep (iii) Poisson's ratio	3	CO1, CO2
Section – B (8 Marks)		
Q5. (a) Find the state of steam whether wet, dry or superheated for the following cases: (i) p = 75 bar, t = 600 °C (ii) t = 90 °C, s = 7.276 kJ/kg Also calculate dryness fraction and degree of superheat in case of wet steam and superheated steam respectively.	3	CO1
(b) Steam is supplied from a boiler at a pressure of 15 bar and 98% dry, to a steam engine. It is found that the steam loses 21 kJ of heat per kg as it flows through the pipe line, pressure remaining constant. Determine the dryness fraction of steam at the engine end of the pipe line.	3	CO1
Q6. (a) A wooden log is 75 mm wide, 150 mm deep and 2.5 m long. It is subjected to an axial pull of 40 kN. The extension of the member is found to be 0.80 mm. Find the Young's modulus for the log material.	2	CO2, CO3
(b) Draw a typical stress strain curve for a mild steel specimen subjected to a tensile force and mention briefly its salient features.	4	CO2, CO3

19 OCT 2016

NCU THE NORTHCAP UNIVERSITY	**THE NORTCAP UNIVERSITY**	**Semester : VIII ME** **Session: 2016-2017**
	Minor-II Examination ,October, 2016	**Total Marks: 20** **Duration: 1 Hrs.**
	School of Engineering & Technology	
	Programme : B-Tech.	
	Course Name: Automobile Systems Engineering **Course Code: MEL-463**	

- **All questions are compulsory.**
- **This Question paper consists of 3 questions**
- **Please write question number on your answer sheet according to question paper**

Course Objectives

CO1: Acquire basic knowledge about the vehicle components, assemblies and systems of an automobile.

CO2: Understand the need, function, requirements, principle, and construction operation of various automobile systems.

CO3: Understand the various types of each system in automobiles.

CO4: Evaluate analyze and select the appropriate system for an automobile and improve their performance.

Section-A

	Questions	Marks	Related COs
Q.1 (a)	Write short answers. Each question carries one mark. (i) List main factors governing the choice of suspension springs? (ii) What is final drive? List different types of final drives? (iii) What is the purpose of helper spring? (iv) Differentiate clearly between the function of spring and shock absorber. (v) What is the purpose of shackle in suspension using leaf springs? (vi) What forces are experienced by semi floating rear axle?	**(6)**	CO2,CO3, CO4

Section-B

Q. 2 (a) What is the principal of air suspension? What are its advantages? **(3)** CO1 , CO2 .CO3

(b) What is the principal of synchromesh gear box? What are its advantages? **(3)**

(c) What is anti roll bar? Describe with the neat sketch its construction and operation. **(2)**

Q.3 Explain with the help of a neat diagram the principle, construction and operation of a double acting twin tube hydraulic shock absorber. **(6)** CO1,CO4

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	Format for Question paper for Minor 2	Review Date:
NCU THE NORTHCAP UNIVERSITY	School of Engineering	Semester: Odd – V Session: (July-Dec) 2016
	Programme: B-Tech (ME) Course Name: Dynamics of Machines Course Code : MEL301 19 OCT 2016	Maximum Marks: 40 Duration :1 hr
		Sheet 1 of 1

Note: 1. All questions are compulsory.
2. Marks are indicated against the questions.
3. Calculator permitted.

Cos Towards the end of the course, the students should be able to:

a) Analyze the dynamics of mechanisms,
b) Synthesize the balancing of a machine statically and dynamically.
c) Design the flywheel, dynamometer, and brake for any application.
d) Understand the concepts of gyroscopic principle and governors.

Part A

Q. 1 – Write the mathematical condition for balancing of a disturbing mass m_1 attached to a rotating shaft balanced by a single mass m_2 attached in the same plane of rotation as that of m_1. **[2][CO2]**

Q. 2 – What do you mean by the term "variation in tractive effort"? Explain briefly with the help of a diagram. Write the equation for maximum and minimum variation of tractive effort. **[4][CO2]**

Q. 3 - Describe the gyroscopic effect of steering and pitching on sea going vessels considering the direction of viewing from stern and star board respectively. **[4][CO4]**

Part B

Q. 4 – Fig. 1 shows, four masses A, B, C, and D are rotating in a single plane with speed 100 r.p.m at radial distances 80 cm, 60 cm, 60 cm, and 80 cm respectively. Find the magnitude and position of mass D for balancing of the system. **[10][CO2]**

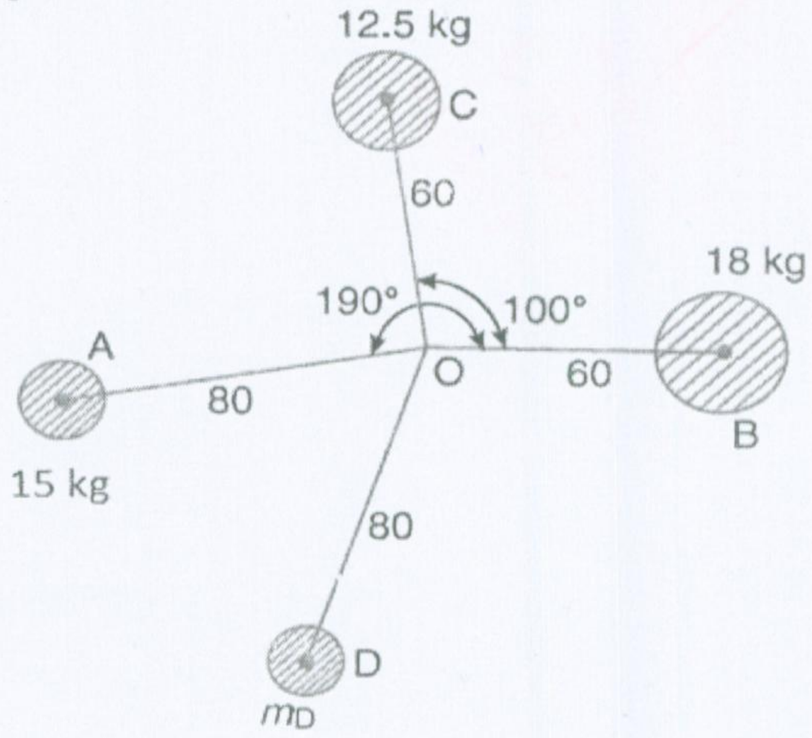

Fig. 1

Q. 5 - The reciprocating masses of the first three cylinders of a four cylinder engine are 4, 6 and 7 kgs respectively. The centre lines of the three cylinders are 50 cm, 80 cm and 110 cm from the fourth cylinder. If the cranks for all the cylinders are equal, determine the reciprocating mass of the fourth cylinder and the angular position of the cranks such that the system is completely balanced for the primary force. The cranks are 0.8 m long, the connecting rods 3.8 m, and the speed of the engine 75 r.p.m. **[14][CO2]**

Q. 6 - A wheel of mass 5 kg and radius of gyration 100 mm is spinning about its axis, which is horizontal and is suspended at a point distant 200 mm from the plane of rotation of the flywheel. Determine the angular velocity of precession of the flywheel. The spin speed of flywheel is 1000 r.p.m. **[6][CO4]**

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NCU THE NORTHCAP UNIVERSITY™	**Minor II**	**Review Date:**
	School of Engineering & Technology	**Semester: Odd III** **Session: (July-Dec)**
	Programme: B-Tech **Course Name: Thermodynamics** **Course Code : MEL 290** 19 OCT 2016	**Maximum Marks: 20** **Duration :1 hrs**
		Sheet 1 of 1

Note: 1. All questions are compulsory.
3. Calculator permitted.

CO1 - Demonstrate understanding of several fundamental concepts of thermodynamics
CO3 - Conduct energy analysis of systems undergoing thermodynamic processes

Section A (2x5 = 10)

Q1. Define the thermal efficiency of a heat engine cycle? Can this be 100%. CO3

Q2. Compare two domestic heat pumps (*A* and *B*) running with the same work input. If *A* is better than *B*, which one provides more heat? CO3

Q3. Explain why the entropy of universe always increases CO1

Q4. Is the value of the integral $\int_1^2 dq/T$ the same for: (a) all reversible (b) all irreversible processes between states 1 and 2? Explain CO1

Q5. Compare two heat engines receiving the same *Q*, one at 1200 K and the other at 1800 K, both of which reject heat at 500 K. Which one is better and why? CO1

Section B (2 x 5)

Q6. A heat pump working on the Carnot cycle takes in heat from a reservoir at 5°C and delivers heat to a reservoir at 60°C. The heat pump is driven by a reversible heat engine which takes in heat from a reservoir at 840°C and rejects heat to a reservoir at 60°C. The reversible heat engine also drives a machine that absorbs 30 kW. If the heat pump extracts 17 kJ/s from the 5°C reservoir, determine CO3

(a) The rate of heat supply from the 840°C source
(b) The rate of heat rejection to the 60°C sink (5)

Q7. (a) Derive an expression for Clausius inequality. CO1,CO3

(b) A heat engine receives reversibly 420 kJ/cycle of heat from a source at 327°C, and rejects heat reversibly to a sink at 27°C. There are no other heat transfers. For each of the three hypothetical amounts of heat rejected, in (a), (b), and (c) below, compute the cyclic integral of dQ/T, from these results show which case is irreversible, which reversible, and which impossible:

(a) 210 kJ/cycle rejected
(b) 105 kJ/cycle rejected
(c) 315kJ/cycle rejected

(5)