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**Knowledge Resource & Relay Centre (KRRC)**


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AIKTC/KRRC/SoET/ACKN/QUES/2021-22/

Date: 02/08/2022School: SoET-REV. C-SCHEMEBranch: MECH. ENGG.SEM: VIII

To,  
Exam Controller,  
AIKTC, New Panvel.

Dear Sir/Madam,

Received with thanks the following **Semester/Unit Test-I/Unit Test-II (Reg./ATKT)** question papers from your exam cell:

Sr. No.	Subject Name	Subject Code	Format		No. of Copies
			SC	HC	
1	Design of Mechanical Systems	MEC801		N/A	
2	Industrial Engineering and Management	MEC802		✓	
3	Power Engineering	MEC803		✓	
4	Department Level Optional Course IV Renewable Energy Resources	MEE802X		✓	
5	Institute Level Optional Course II				

Note: SC – Softcopy, HC - Hardcopy

(Shaheen Ansari)  
Librarian, AIKTC

20/05/2022  
MECH - morningUniversity of Mumbai  
Examinations Summer 2022

Time: 2hour 30 minutes Max. Marks: 80

SUB-IEM

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Which of the following is NOT concerned with scientific management?
Option A:	F. W. Taylor's
Option B:	Taguchi
Option C:	Gilbreth
Option D:	Gantt
2.	Value analysis technique comprises
Option A:	Development of new methods
Option B:	Measurement to complete a job
Option C:	Watching actions of body parts during service
Option D:	Reducing the cost of items and services
3.	Four key elements for developing agile manufacturing are
Option A:	Strategic planning, Product design, Virtual enterprise, Enterprise Resource Planning
Option B:	Strategic planning, Product design, Virtual enterprise, Automation and Information Technology
Option C:	Virtual enterprise, Product design, Value Analysis, Automation and Information Technology
Option D:	Automation and Information Technology, Strategic planning, Product design, Virtual enterprise, Digital Scanning
4.	In SIMO chart, the movements are recorded against time measured in
Option A:	Minutes
Option B:	Seconds
Option C:	Micro seconds
Option D:	Winks
5.	Therblig is described by standard symbol and color in
Option A:	Macro-motion study
Option B:	Gantt chart
Option C:	Micro-motion study
Option D:	Curve chart
6.	Ergonomics is related to
Option A:	Value analysis
Option B:	Human engineering
Option C:	System analysis
Option D:	Management engineering
7.	Material handling equipment, roller/belt conveyor are used for the
Option A:	Continuous movement, and relatively short distance
Option B:	Interrupted movement, and relatively short distance
Option C:	Interrupted movement, and relatively large distance
Option D:	Continuous movement, and relatively large distance
8.	Group Technology implies the notion of recognizing and exploiting similarities in following different ways, EXCEPT
Option A:	by efficiently storing and retrieving the information about recurring problems
Option B:	By restraining the grouping of general-purpose machines



Option C:	by standardizing the similar tasks
Option D:	by performing the like activities together
9.	Tools and techniques of Lean Manufacturing are- I. Takt Time II. Cellular Manufacturing III. Supplier relation IV. Pull Systems and Kanban
Option A:	I, II, III
Option B:	II, III, IV
Option C:	I, II, IV
Option D:	I, III, IV
10.	Which of the following components is not included in the flexible manufacturing system?
Option A:	Processing Stations
Option B:	Material Handling and Storage System
Option C:	Auxiliary Equipment
Option D:	Value stream mapping

<b>Q2</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Define productivity. What are the factors influencing productivity of an enterprise? Explain with examples.
B	List various work measurement techniques and discuss anyone in detail.
C	What do you understand by Job Evaluation? What are its objectives? Explain Job Evaluation Process.

<b>Q3</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Delineate value engineering and Steps in the value engineering. Distinction between value engineering and value analysis.
B	A work sampling study was conducted for 100 hours in the machine shop in order to estimate the standard time. The total number of observations was 2500, No. of working activity could be noticed for 400 observations. The ratio between manual and machine elements was 2:1. average rating factor was estimated as 1.15 and total number of articles produced during the study period was 6000. Rest and personal allowances are 12% of the normal time. Estimate standard time to perform the operation. Answer:
C	What is facility location decision? Describe the factors which influence the location decisions while setting up an Electric car manufacturing company.

<b>Q4</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Describe ergonomics. Explain the importance of anatomy, physiology and psychology w.r.t ergonomic discipline
B	Define Material Handling System. What are the important principles of material handling?
C	Write short note: (Any Two) (i) Key elements for developing Agile Manufacturing (ii) Flexible Manufacturing (iii) Value Stream Mapping.



Option C:	by standardizing the similar tasks
Option D:	by performing the like activities together
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Time: 2 hour 30 minutes

CBCS

Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Draft tube is used for discharging water from the exit of
Option A:	an impulse turbine
Option B:	a Kaplan turbine
Option C:	a Pelton wheel
Option D:	a reciprocating pump
2.	Turbofan engine is preferred over turbojet due to
Option A:	high propulsive efficiency
Option B:	high thrust
Option C:	reducing noise
Option D:	all of these
3.	The use of recuperator in gas turbine plant is to
Option A:	increases thermal efficiency
Option B:	increase work output
Option C:	increase efficiency and power output
Option D:	decreases thermal efficiency
4.	Difference between impulse and reaction turbine is that
Option A:	in impulse turbine only pressure energy converted into work but in reaction turbine pressure and kinetic energy converted to work
Option B:	in impulse turbine only pressure energy converted into work but in reaction turbine kinetic energy converted to work
Option C:	in impulse turbine only kinetic energy converted into work but in reaction turbine pressure and kinetic energy converted to work
Option D:	in impulse turbine only kinetic energy converted into work but in reaction turbine pressure converted to work
5.	What is the Stoichiometric (Theoretical) A/F ratio for the combustion of Methane CH <sub>4</sub> on mass basis?
Option A:	10.58
Option B:	19.58
Option C:	9.58
Option D:	12.58
6.	Cavitation in Centrifugal pump can be reduced by
Option A:	reducing the discharge
Option B:	reducing the suction head
Option C:	increasing the discharge
Option D:	increasing the flow velocity
7.	For given pressure and temperature conditions of reactants maximum adiabatic flame temperature is achieved with
Option A:	weak mixture
Option B:	rich mixture
Option C:	stoichiometric mixture



	mixture with 10% excess air
8.	Fusible plug is used
Option A:	to extinguish fire in furnace
Option B:	to control pressure
Option C:	to control water level
Option D:	to control steam generation
9.	Francis turbine is
Option A:	an impulse turbine
Option B:	a radial flow impulse turbine
Option C:	an axial flow turbine
Option D:	a reaction radial flow turbine
10.	If diameter of a centrifugal pump impeller is doubled but discharge is to remain same, then the head needs to be reduced by
Option A:	2 times
Option B:	4 times
Option C:	8 times
Option D:	16 times

<b>Q2.</b> <b>(20 Marks)</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	What is the difference between water tube and fire tube boilers?	
B	What is cavitation and what are its causes? How will you prevent the cavitation in hydraulic machine?	
C	Steam is generated at 11 bar and 250 °C in boiler from feed water at 26 °C. The calorific value of the coal used is 33707 kJ/kg. Calculate the factor of evaporation and equivalent evaporation from and at 100 °C. Also calculate the boiler power if 260 kg/h of coal is burnt.	
D	Explain velocity compounded impulse steam turbine showing pressure and velocity variations along the axis of the turbine.	
E	Differentiate between jet propulsion and rocket propulsion.	
F	Obtain the expression for the force exerted by a jet of water on a fixed curved plates when jet strikes at the center of a symmetrical curved blades.	

<b>Q3.</b> <b>(20 Marks)</b>	<b>Solve any Two Questions out of Three</b>	<b>10 marks each</b>
A	In a De-Laval turbine, the mean diameter of the blade is 80 cm and the speed of rotation is 3000 rpm. The steam issues from the nozzles with a velocity of 300 m/s and the nozzle angle is 20°. The blades are equiangular. The friction factor is 0.8. What is the power developed in the blades when the axial thrust on the blades is 140 N?	
B	The penstock supplies water from a reservoir to the Pelton wheel with a gross head of 500 m. One third of the gross head is lost in friction in the penstock. The rate of flow of water through the nozzle fitted at the end of the penstock is 2 m <sup>3</sup> /s. The angle of deflection of the jet is 165°. Determine the power given by the water to the runner and also hydraulic efficiency of the Pelton wheel. Take speed ratio 0.45 and velocity coefficient 1.0.	



C	A Francis turbine has a diameter of 140 cm and rotates at 430 rpm. Water enters the runner without shock with a flow velocity of 9.5 m/s and leaves the runner without whirl with an absolute velocity of 7 m/s. The difference between the sum of static and potential heads at entrance to the runner and at the exit from the runner is 62 m. The turbine develops 13000 kW. The flow rate through the turbine is 12 m <sup>3</sup> /s for a net head of 115 m. Find the following: i) The absolute velocity of water at entry to the runner and the angle of the inlet guide Vanes ii) The entry angle of the runner blades and iii) The loss of head in the runner
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<b>Q4.</b> <b>(20 Marks)</b>	
<b>A</b>	<b>Solve any Two</b> <span style="float: right;"><b>5 marks each</b></span>
i.	Explain Ramjet engine with neat diagram. What are its basic characteristics?
ii.	Write short notes on "Enthalpy of Formation".
iii.	Explain the principle of working of Pelton turbine. Draw velocity triangle.
<b>B</b>	<b>Solve any One</b> <span style="float: right;"><b>10 marks each</b></span>
i.	In a gas turbine plant, the air enters the compressor at 0.15 Mpa and 20 °C. The maximum pressure and temperature of the cycle are 1.2 Mpa and 1200 °C respectively. Determine the cycle thermal efficiency if the turbine and compressor efficiencies are 85 % each.
ii.	A Single-acting reciprocating pump has stroke length of 15 cm. The suction pipe is 7 meter long and the ratio of the suction diameter to the plunger diameter is $\frac{3}{4}$ . The water level in the sump is 2.5 meters below the axis of the pump cylinder, and the connecting the sump and pump cylinder is 7.5 cm diameter. If the crank is running at 75 rpm, determine the pressure head on the piston: (i) in the beginning of the suction stroke, (ii) in the end of the suction stroke, and (iii) in the middle of the suction stroke. Take coefficient of friction as 0.01.



Q1.	Choose the correct option for following questions. All the Questions are compulsory and carry equal marks
1.	Ocean thermal energy is produced due to
Option A:	Pressure difference at different levels in the ocean.
Option B:	Temperature difference at different levels in the ocean.
Option C:	Energy stored by waves in the ocean.
Option D:	Tides rising out of the ocean.
2.	KVIC model plants are
Option A:	Fixed Dome Biogas Plants
Option B:	Floating Drum Biogas Plants
Option C:	Balloon Biogas Plants
Option D:	Polyethylene Tube Digester Biogas Plants.
3.	Path length of radiation through the atmosphere to the length of path when the sun is at zenith is called
Option A:	Declination
Option B:	Air mass
Option C:	Azimuth
Option D:	Solar Constant
4.	The angle through which the earth must turn to bring the meridian of a point directly in sun's rays is called
Option A:	Declination
Option B:	Zenith angle
Option C:	Latitude
Option D:	Hour angle
5.	At wind speed exceeding the rated value, the rotor speed is held constant by automatic adjustment of _____ of blades.
Option A:	Pitch
Option B:	speed of rotor
Option C:	chord length of blades
Option D:	increasing load on blades
6.	The fraction of time during a given period that the turbine is actually on line is called?
Option A:	Cut out velocity
Option B:	Flat rating
Option C:	Availability factor
Option D:	Cut in velocity
7.	If retention period is $r$ and volume of fluid in digester is $V$ , the digester volume is given by
Option A:	$V/r$



Option C:	V+r
Option D:	V-r
8.	What is Hour angle at 10.30 am ?
Option A:	-22.5°
Option B:	22.5°
Option C:	-45°
Option D:	45.°
9.	What is duration between two high tide?
Option A:	29 days 44 min
Option B:	6 h 25 min
Option C:	12 h 50 min
Option D:	14 days
10.	The process of producing energy by utilizing heat trapped inside the earth surface is called
Option A:	hydrothermal energy
Option B:	solar energy
Option C:	geo-Thermal energy
Option D:	wave energy

<b>Q2</b>	<b>Solve any Four out of Six</b>	<b>5 marks each</b>
A	Explain any two solar radiation measurement devices.	
B	Calculate the variation of day length over a year on 19 <sup>th</sup> of each month of 2020 for location of Delhi (28°35'N,77°42'E)	
C	Calculate the useful heat content per square km of dry rock granite to a depth of 7 km. Take the geothermal temperature gradient at 40°C/km, Take the minimum useful temperature as 140 K above the surface temperature, and rock density of 2700kg/m <sup>3</sup>	
D	Write short note on OTEC plant.	
E	Explain any one wave energy conversion device.	
F	Differentiate between Horizontal axis and Vertical axis wind turbines.	

<b>Q3</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Estimate the monthly average global radiation on a horizontal surface at Ratnagiri (16°59'N,72°05'E) during the month of march if the average sunshine hour per day is 9.5. Take a=0.31 and b=0.43
B	Explain the various factors in details which affect the production of biogas.
C	What is betz coefficient? Derive maximum power coefficient for horizontal axis wind mill.

<b>Q4</b>	<b>Solve any Two Questions out of Three 10 marks each</b>
A	Define and explain 1) latitude 2) Hour angle 3) Declination 4) Day length 5) Slope
B	Draw and explain working of KVIC design of biogas digester
C	Calculate the number of animals and volume of bio digester required to produce Power for a household which has power requirement of 0.8 kW for lighting and cooking purpose. Take calorific value of methane as 28 MJ/m <sup>3</sup> , Burner efficiency as 70%, Retention period as 25 days, Dry matter per animal per day per animal is 1.8 kg, density of dry matter in slurry in digester is 50 kg/m <sup>3</sup> , Biogas yield is 0.3m <sup>3</sup> per kg of dry input, Methane proportion in gas is 0.7.